



# **DTOOLKIT: SERVICE DESIGN FOR NEURODIVERSITIES**

Creating enabling spaces for neurodivergent kids to promote a more inclusive environment in the classroom context for the benefit of all



**POLITECNICO**  
**MILANO 1863**

**SCUOLA DEL DESIGN**

**THESIS BY**

Mariella Cappelletto  
965778

**THESIS TITLE**

DToolkit: Service Design for Neurodiversities  
Creating enabling spaces for neurodivergent kids  
to promote a more inclusive environment in the classroom  
context for the benefit of all

**SUPERVISOR**

Prof. Alessandro Confetti

Master Degree in PSSD (Product-Service System Design)  
School of Design, Politecnico di Milano  
Academic Year 2021-2022



*Ad Elisa e Chiara*

# ABSTRACT

## ITALIANO

La *neurodiversità* può essere descritta come la naturale differenza neurologica nell'elaborazione delle informazioni e nel funzionamento del cervello. Il termine *neurodiversità* ci insegna a riconoscere gli individui con questo tipo di differenze neurologiche come persone con un modo "atipico" di percepire e di interagire con la realtà, piuttosto che come disabili. Chiunque sia affetto da Disturbo da Deficit di Attenzione e Iperattività (ADHD), Disprassia, Disturbo dello Spettro Autistico (ASD) e Dislessia è considerato neurodiverso, insieme a tutti coloro che soffrono di particolari condizioni neurologiche che influenzano le loro capacità di pensiero e di apprendimento. I neurodiversi interagiscono con le persone, si comportano e percepiscono il mondo in modo differente da quello che è considerato "tipico" (o *neurotipico*) e questo è spesso causa di una loro esclusione da contesti sociali. Le basi socioculturali della nostra società infatti, vanno incontro perlopiù ai bisogni di una piccola gamma di individui, il che significa che alcuni spazi pubblici potrebbero non essere accessibili a tutti o che le condizioni di lavoro potrebbero non essere inclusive nei confronti di coloro che apprendono e pensano in modo diverso.

I bambini neurodiversi iniziano a percepire le frustrazioni legate alla mancanza di accessibilità durante i loro primi anni di scuola. Se si trovano in un ambiente che per loro non è validante, possono presentare disturbi di salute, perdere fiducia in sé stessi e diventare nervosi o aggressivi sia con gli insegnanti che con i compagni. Per questo motivo, dal punto di vista degli educatori, è fondamentale esplorare nuove metodologie per rendere l'apprendimento più accessibile e per creare un ambiente-scuola fisicamente e psicologicamente più sicuro e che sia in grado di abbattere le barriere contro l'esclusione. Le istituzioni pubbliche dovrebbero provvedere a fornire approcci alternativi agli insegnanti, che vadano incontro alle esigenze delle neurodiversità e che promuovano l'inclusività offrendo soluzioni di cui tutti i bambini possano beneficiare.

L'obiettivo di questa tesi è quello di indagare il contributo che il Service Design può offrire nel supportare gli insegnanti a migliorare l'inclusività nelle classi delle scuole primarie, indagando le frustrazioni e i fattori di stress percepiti dai bambini con neurodiversità con l'obiettivo di ottenere un ambiente più confortevole, sicuro ed accessibile per tutti.

## ENGLISH

*Neurodiversity* can be described as the natural neurological difference about how people process information and how brain works. The word *neurodiversity*, teaches us that brain differences have to be recognized as a "non-typical" way of experiencing and interacting with the world, rather than as disabilities. People with Attention Deficit Hyperactivity Disorder (ADHD), Dyspraxia, Autism Spectrum Disorder (ASD), and Dyslexia are usually categorized as neurodivergent, together with any person suffering from a medical condition that affects their thinking skills. Neurodiversities could interact, learn, behave and experience the world in a different way from what is considered as "typical" (or *neurotypical*), and this usually causes their exclusion. In fact, the socio-cultural architecture of our society is equipped, in the majority of the cases, to support just a small range of variability, this means that public spaces could be poorly designed or that the working conditions could not be accessible by those who learn and think differently.

Neurodiverse kids start experiencing frustrations related to the lack of accessibility during the first years of school. If they are in a disabling environment, they could feel sick, lose self-confidence and become nervous or aggressive with teachers and companions. This is the reason why, from educators' perspective, it is fundamental to explore different ways of making learning more accessible and of creating a physically and psychologically safe environment that could eliminate the barriers to participation and healthiness for neurodivergencies. Public institutional practices might provide alternative approaches for teachers that embrace the neurodiversity paradigm and offer solutions that could promote inclusivity and benefit all the children.

The aim of the thesis is investigating the contribution that Service Design can give to support teachers in improving the inclusivity and the accessibility of the classrooms of primary school, investigating the frustrations and the stress factors experienced by neurodiversities with the objective to promote a comfortable and safe environment for all the kids.

# INDEX OF CONTENTS

## 2.

### THE CONCEPT OF NEUROTYPED

- 2.1 NEUROTYPICAL AND NEURODIVERSE p.16
- 2.2 WORDS MATTER! p.16
- 2.3 WHY NEURODIVERGENT PEOPLE EXPERIENCE STRESS? p.17

## 3.

### DESK RESEARCH: ADHD

- 3.1 USER-CENTERED APPROACH p.19
- 3.2 WHAT IS ADHD? p.20
- 3.3 ADHD'S ORIGINS p.21
- 3.4 TREATMENTS FOR ADHD p.22
- 3.5 ADHD AT SCHOOL p.24

## 6.

### DTOOLKIT: DO IT TOGETHER

- 6.1 THE CONCEPT p.71
- 6.2 VISION & MISSION p.72

## 7.

### THE SERVICE

- 7.1 DIGITAL TOUCHPOINTS p.76
- 7.2 THE OFFER p.78
- 7.3 THE TARGET p.82
- 7.4 CORE PRINCIPLES p.84
- 7.5 RELATIONSHIPS MAP p.86
- 7.6 ECOSYSTEM MAP & STAKEHOLDERS p.88
- 7.7 PERSONAS: LARA, THE YOUNG TEACHER p.93
- 7.8 PERSONAS: VALERIO, THE HYPERACTIVE KID p.99
- 7.9 BUSINESS MODEL AND ECONOMIC PLAN p.102
- 7.10 MOCKUP p.108
- 7.11 BRANDING p.130

## 0.

### INTRODUCTION

- WHY HAVE I CHOSEN THIS TOPIC? p.9

## 1.

### METHODOLOGICAL APPROACH

- 1.1 THE METHOD p.12
- 1.2 CORE PRINCIPLES p.14
- 1.3 OBJECTIVES p.15

## 4.

### USER RESEARCH AND PROBLEM DEFINITION

- 4.1 USER RESEARCH INTRODUCTION p.27
- 4.2 BIOLOGICAL STRESS RESPONSE: DISABLING AND ENABLING SPACES p.27
- 4.3 IN THE CLASSROOM CONTEXT p.32
- 4.4 STRESS-RELATIONSHIPS-TRUST CYCLE p.36
- 4.5 CASE STUDIES p.38
- 4.6 FOCUS GROUP p.46
- 4.7 SEMI-STRUCTURED INTERVIEWS p.50
- 4.8 INSIGHTS CLUSTERING AND RESEARCH QUESTION p.58

## 5.

### EXPLORING OPPORTUNITIES

- 5.1 HOW MIGHT WE...? p.61
- 5.2 SOME INTERESTING APPROACHES p.62
- 5.3 FORMULATING THE FRAMEWORK p.68

## 8.

### TESTING THE METHOD

- 8.1 SCOPE OF THE TESTING p.137
- 8.2 WHAT IS A KANBAN BOARD? p.139
- 8.3 THE STEPS p.140
- 8.4 INTERVIEWS p.150
- 8.5 RESULTS p.157

## 9.

### CONCLUSION

- OPEN POINTS AND OPPORTUNITIES p.161

## 0. INTRODUCTION

### WHY HAVE I CHOSEN THIS TOPIC?

I am the oldest of three daughters and I have been babysitting since I was 16. I love being with children, I love how they learn and how they are curious, how they observe the world and how they are surprised about things that we take for granted.

I learnt a lot from my experience as a babysitter, and I also had the chance during high school to learn from my own childhood because I went to therapy for some years after my parent's separation. I learnt that taking care of a child is a delicate exercise of empathy and patience, and it is fundamental because adult well-being, personality and effective behaviors are the result of a complex web of biological, social, and psychological influences unfolding over the life course, with the beginning in the very first years. There are associations between childhood traits and adult's outcomes, this means that understanding children's needs, whichever they are, and providing to them an healthy and safe context of growth, benefits to their mental wellness and self realization during the whole life.

When it came the time to pick the thesis topic, It was a complex choice to take, both because I had many interesting ideas but also because I could define myself as an "eternally doubtful soul". Anyway, before starting I knew that I had two elements that I would have loved to include in my research: behavior Design and Design for children. In particular, I had read some books and papers related to Behavior Change that fascinated me a lot:

- Matè G., *Scattered Minds: The Origins and Healing of Attention Deficit Disorder*, Random House UK, January 3, 2019
- Fisch R. , Weakland J. H., Segal L., *Change: le tattiche del cambiamento. La psicoterapia in tempi brevi*, Astrolabio Ubaldini 2017.
- Sapolsky R., *Behave: The Biology of Humans at Our Best and*

Worst, Penguin Press. 2 May 2017, pp. 250-260.

- Brewer J., *The Craving Mind: From Cigarettes to Smartphones to Love – Why We Get Hooked and How We Can Break Bad Habits*. Yale University Press, February 6, 2018
- Dr Dow M., *The Brain Fog Fix: Reclaim Your Focus, Memory, and Joy in Just 3 Weeks*, Hay House Inc., December 13, 2016

I also participated to an elective course at Politecnico di Milano about “Effective Relationships, Improve your NTS” (by Corrado Arrigoni). It was all about improving interpersonal relationships thanks to Non-Technical Skills’ s training.

Then, I decided to move a little from the complex world of behavior change and behavior Design, however, there was a thing that I learnt about the course “Effective Relationship II” that was incredibly helpful for my thesis. I discovered that each individual has a different brain pattern and has different NTS that can be improved with training in order to obtain successful results in relationships, cognitive and stress management dimensions. Understanding that our brains work all differently allows us to accept our and others’ limits and makes us aware of the fact that we can learn how to manage lacking skills, but we cannot change completely, because this is what makes our personality.

I started from this concept that fascinated me so much, to look into the direction of Inclusive Design.

One day, thanks to Valeria Della Rosa, Head of Client Services of Thoughtworks (Italy) and exceptional mum of a 7 years old child that has been diagnosed as Autistic and with ADHD, I had the chance to discover the concept of neurodiversity and to read about Design for Inclusivity and for neurodiversities.

The British Council of Offices in 2022, released a research *Design For Neurodiversity*. It was about how to design enabling work and public spaces for people of different neurotypes, to promote inclusivity and accessibility for every typology of brain pattern and behavior, and this was the paper that inspired me the most.

I decided that I would have made all the possible efforts to find my role as Service Designer in supporting the accessibility of different neurotypes of children, starting from the needs of children with ADHD.

I decided to speak with some experts in what we call cognitive and relational “disabilities”, so I contacted the mum of a lovely child who I used to babysit in the past: Doctor Francesca Onnis, therapist expert in Autism and ADHD management currently working for Studio Amadei (Paderno Dugnano, Milan) but with experience in hospital of San Raffaele (Milan) and Bambin Gesù (Rome).

Then I had the chance to speak with Gianna Frasca, Child Neuropsychiatrist, Director of ASST Monza - Desio and then with more than one Italian and even American Elementary school teachers’ who had experience with children diagnosed

with different “disabilities”, but in particular with ADHD.

Hearing from the expertise of different people, made me sensitive regarding this topic, and I discovered many pain points regarding in particular the obstacles and difficulties in the school system: the lack of guidelines and concrete support for teachers makes the school environment not so inclusive and for this reason both teachers and kids experience a lot of stress.

I interviewed teachers trying to understand their frustrations related to the teaching-learning dimension, the planning tools, the space and the interpersonal relationships. Then I explored children’s challenges, needs, difficulties and relational obstacles, and I tried to look for possible opportunities that could improve the condition of both of them in the context of public primary school in Italy..

The core principles of Participatory Design and Child-Centered Design guided me in gathering important insights: these approaches supported the design process of my thesis towards a service that meets customer needs, ensuring that the development was pleasant and meaningful for all parties involved.

Combining the process and the tools of Service Design with the idea of Design for neurodiversities, was crucial in my research to develop an effective solution for children.

I think this could be a great opportunity to provide the teachers with the right tools and to set up a supportive service in order to improve the public school context and normalize the differences.

# 1. METHODOLOGICAL APPROACH

## 1.1 THE METHOD

The methodology that I have adopted for my thesis research could be resumed with the Double Diamond map (fig. 1) of the Service Design process (developed by the British Design Council in 2004). The model served as guided me throughout all the steps of the process. As the British Design Council describes(\*):

«As well as highlighting the design process, Design Council's framework for innovation also includes the key principles and design methods that designers and non-designers need to take, and the ideal working culture needed, to achieve significant and long-lasting positive change.»

The phases of my research correspond to the moments of divergence and exploring, and to the ones of convergence and focusing in a specific direction. It hasn't been a linear process, and the iterations were fundamental in order to build a valuable outcome, together with interviewing, testing and prototyping.

I can identify these phases:

- **Research.** (Discover, moment of divergence) I explored the topic of behavior design, looking at all the possible interesting opportunities and ways and collecting meaningful insights;
- **Insights.** (Define, moment of convergence) I decided to select the elements part of my research, I ordered the insights and I focused on children with ADHD and on neurodiversities;
- **Iterate.** I decided to go back and to research more about the topic, moving the initial focus on Design for inclusivity. I wanted to have a general and clear overview about it, for this reason I collected many perspectives with interviews, desk and field

\* British Design Council (2015). Design Council: Design methods for developing services. Available from: <https://www.designcouncil.org.uk/our-work/skills-learning/resources/design-methods-developing-services/>

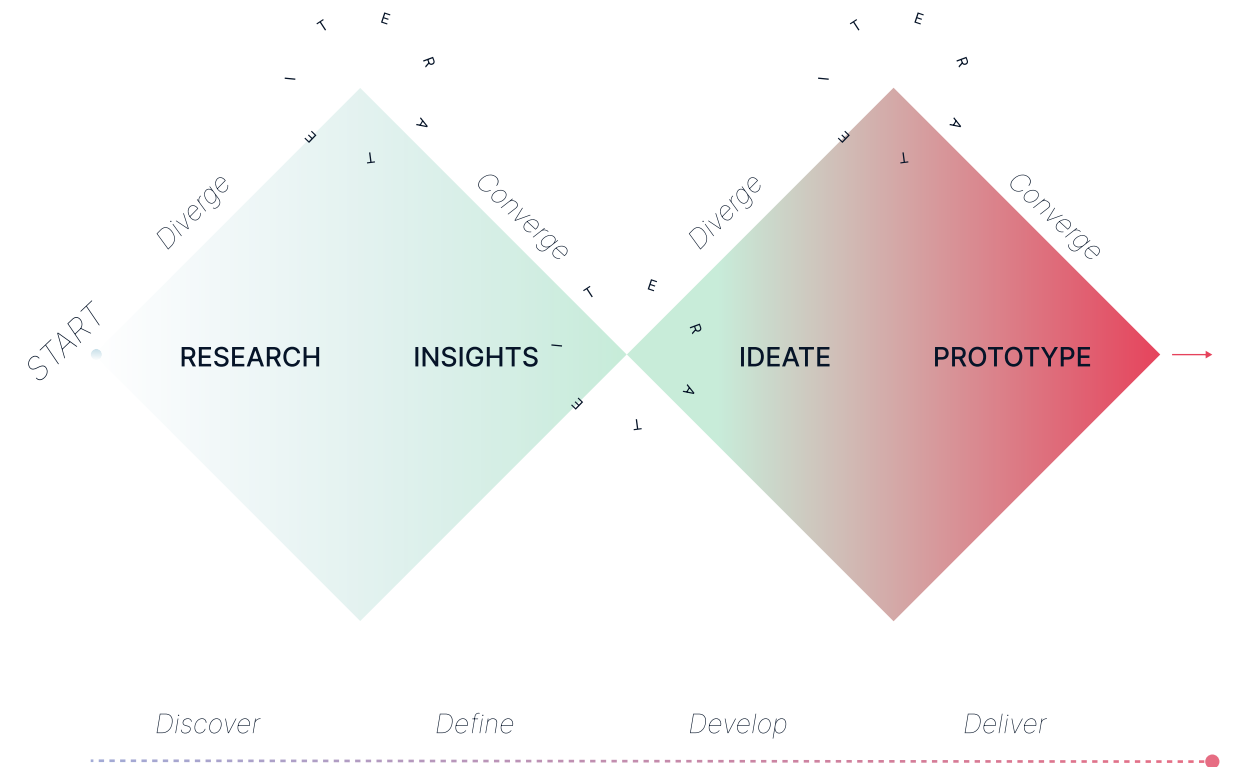


fig. 1 The Double Diamond Design thinking process (Adopted from the Design Council in 2004)

- **Problem definition.** From an accurate exploration of the challenges experienced by the teachers and the children with ADHD at school, I defined the research question/s;
- **Ideate** (Develop, moment of divergence): I started looking into the opportunities that could allow me, as a Service Designer, to give a valuable contribution to the problem. I iterated again. I researched the Participatory

Design and Child-Centered approach, I developed a possible solution to test with teachers and children and I asked for feedback (this means that I did another phase of interviews). Then I formulated the proposal to test.

- **Prototype** (Deliver, moment of convergence): I tested the core elements of the solution, being aware that the output shouldn't be definitive but just a starting point to improve and define properly.

## 1.2 CORE PRINCIPLES

Throughout the entire process of research, ideation and testing, I have applied the principles that remark on the Design Thinking framework. These core principles are fundamental for problem-solvers in order to develop successful and effective innovations with a creative scope(°).

I have selected the most meaningful for me during my research:

- **User-Centered Design:** *Put people first!*. Users represent the heart of the entire Design process, and for this reason in all my research I tried to be as close as possible to them. I studied people, situations and contexts where they live, trying to understand their perspectives, their needs and the challenges they experience in their daily lives collecting qualitative datas. Listening to their stories is the first thing to do in order to provide effective and valuable insights.
- **Iterativity:** *Iterate and implement*. Iterative process allowed me to improve every time what I was working on, building up confidence in my ideas. It permitted me to understand my mistakes and to try different directions in order to create a focused and effective solution.
- **Co-creation and collaboration:** *Collecting feedback*. Designing for people is different from designing with people. I had the chance to collect as much feedback as possible about real-life experience of the context and of the space and then about the service, with the ideas about how to improve it. This became essential for my research. Over all, working together with people and being inspired of other's ideas resulted fundamental in the development of a solution that became valuable for a broader target population.
- **Creativity and fun:** *Difference pushes orizons*. Listening to different perspectives took me out of my box and my comfort zone, allowing me to open my mind and to be able to improve myself as a person, not just as a designer. The variety of ideas presents the primary source of innovative outcomes.

\* British Design Council (2015). Design Council: Design methods for developing services. Available from: <https://www.designcouncil.org.uk/our-work/skills-learning/resources/design-methods-developing-services/>

## 1.3 OBJECTIVES

The aim of the thesis is investigating with a Service Design approach, how to support teachers in creating enabling and comfort spaces for children with different neurotypes in order to build a more inclusive classroom context. This should be done with an effective and low-budget solution, since the objective is addressing the problems of public contexts.

I combined the principles of Design Thinking(\*) together with the intention of the research in order to establish the **main goals** of the project:

- Setting a new innovative strategy about how to design a more **inclusive classroom** for children exploring the dimensions of space, time and relationship with peers.
- Using the principles of **Child-Centered Design** in order to build a flexible and personalized service that could help teachers in addressing the needs of children and facilitate their management of a variegated classroom.
- Creating a **network of experts** that could support teachers with concrete and effective guidelines that could become part of the new normality of the primary public school context.

## 2. THE CONCEPT OF NEUROTYPE

### 2.1 NEUROTYPICAL AND NEURODIVERSE

The word “neurotypical”, has origins in the autistic community (neurodiversity movement, 1990), as a way to refer to non-autistic people, and it is used to describe a person whose neurological development and state are conforming to what most people would perceive as normal. People whose neurological development is atypical, are called “neurodivergent”: these are people with autism, Asperger’s syndrome, dyslexia, dyscalculia, epilepsy, hyperlexia, Dyspraxia, ADHD, obsessive-compulsive disorder (OCD), and Tourette syndrome (TS); Left-handedness, gender identity disorder, homosexuality, bisexuality, and asexuality are sometimes also included are referred to as neurodivergent.

The neurodiversity movement, aimed to increase acceptance and inclusion of all people while embracing neurological differences. Judy Singer, an Australian sociologist, coined the term neurodiversity to promote equality and inclusion of “neurological minorities.”

The education regarding neurodiversities has become essential, since it significantly influences the perspective of researchers and clinicians about how to address some neurological conditions.

### 2.2 WORDS MATTER!

For neurodiversities wording is extremely important. The basic idea of neurodiversity is that differences don’t have to only be looked at as weaknesses or moreover problems that need to be “fixed” or “cured.” They’re simply variations of the human brain, and for this reason it is offensive for most neurodivergent people to be described with the word “deficit” or “disease”.

The reason why common knowledge established that neurodivergent is associated with “pathologic” is that these people have different brain patterns than what we consider as normal, and experience the world in a different way. This doesn’t mean that they interact in a wrong way with people and space, it’s just the context and the space that lacks appropriate infrastructures to support their inclusivity and accessibility.

Despite differences should be seen as part of normality and not as deficits, having a “diagnosis” is something that should not be seen as bad: it should increase the awareness regarding the need of support and accommodations for every different brain pattern.

In particular within a school or working environment it is fundamental because:

- It promotes normalization of diversity;
- It encourages research about accessibility and support;
- It makes it clear that everyone in every context has challenges that deserve support;

Each of these terms (“neurodivergency” and “disability”) is valuable in order to recognize and support inclusivity in every context, this is the reason why I will use both of them throughout my thesis.

### 2.3 WHY NEURODIVERGENT PEOPLE EXPERIENCE STRESS?

We have affirmed that the neurodivergent brain processes information in a different way from other brains. This means that a lack of adequate support and accessibility in private or public context (especially at school or in the workplace), can bring them to bad performances and, consequently, to experience a lot of stress and poor wellbeing. Essentially, the more they “mask” acting neurotypical, the more they suffer

and get unhappy.

Some of the main challenges that these people could experience at school or in a workplace are:

- Difficulty in focusing
- Issues with timekeeping
- Respecting a schedule
- Visual impediment

The Equality Act for the workplace that was written in 2010 protects many neurological diseases, and individuals against discriminations.

In Italy, a protection law has been released from MIUR in 2010 support at school to neurodivergencies, in order to guarantee that those with particular characteristics are treated equally, with the same rights, status, and opportunities. Despite these, the situation is still problematic, and there is still a lack of knowledge and awareness, especially in the public contexts.

It is fundamental to prevent bullism, stress and depression of neurodivergent people by accepting and contributing to build an healthy working environment:

- **Improving wellbeing:** by adding assistance and extra support. This will increase the confidence, safeness of every worker, not only for those who are neurodiverse.
- **Encouraging openness:** by promoting equal treatments for everyone and helping people to talk about their differences.
- **Promoting inclusivity:** by supporting the strengths and addressing the needs of each member of the group.

Doing this, as we will see in the thesis, doesn’t require innovative technological devices or expensive tools, but a special awareness, an inclusive perspective about how to face daily activities, and by simply leading by example and showing an attitude of respect and equality.



## 3. DESK RESEARCH: ADHD

### 3.1 USER-CENTERED APPROACH

I have decided to set the focus and to research about a specific group of neurodivergent people: the ones who experience Attention Deficit Hyperactivity Disorder (ADHD) and, as I mentioned in the introduction, in particular to children.

My choice doesn't have a specific reason. I just found myself extremely attracted by those who experience the condition of ADHD when I started exploring the world of neurodivergence, and I developed a particular sensitivity for this "category" (if we could call it like this) because one of the kids that I used to babysit more, was one of those.

I had also the chance during these months, to meet a series of extraordinary people: mums of children with ADHD, teachers with expertise in neurodivergence, psychologists and a neuropsychiatrist who work with children with ADHD and other neurological deficits, and I discovered that even one of my dearest friends has ADHD.

I think that other than reading about research and literature, what made me passionate about the topic was the opportunity to be in touch with people, to hear their stories, how interact with ADHD subjects, which challenges and frustrations they experience, and how they have found a way to adapt to the situations. Empathizing with them has given me more than what I have tried to look into the papers and the books I have read.

What was incredibly fulfilling, was to see the hope and the gratefulness in their eyes when I showed interest in exploring the opportunities that I had as Service Designer to fight for their rights and to propose a contribution.

I'm grateful to have had the chance to do this incredible job, and I think that this is the thing that motivated me more and moved me towards that direction.

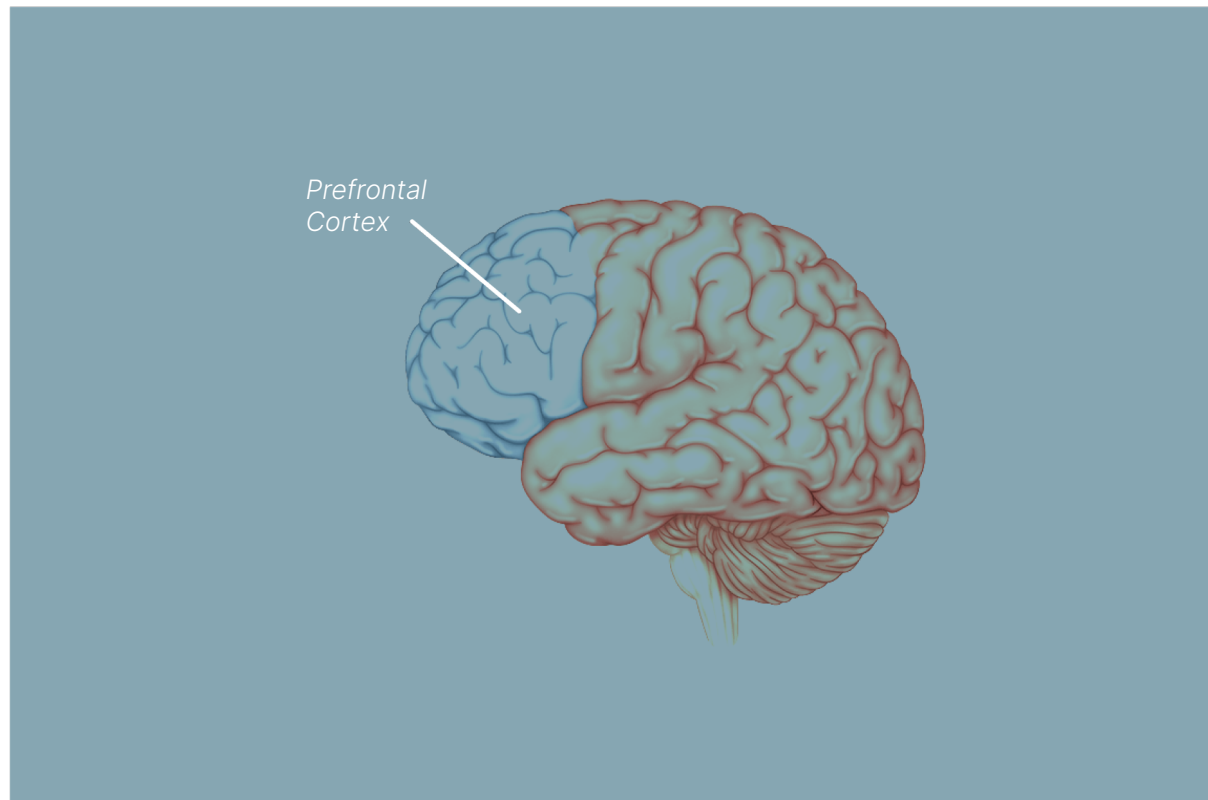


fig.2 Prefrontal cortex

### 3.2 WHAT IS ADHD?

ADHD (Attention Deficit Hyperactivity Disorder), is a neurodevelopmental disease that affects 2% of Italian children (Istituto Superiore di Sanità, Rome) and lasts permanently into adulthood. It causes many problems in focusing on tasks for a long time, controlling impulsive behaviors, being patient and having normal relationships with people. Children with ADHD, experience problems both in regulating attention and emotions which can result in hyperactivity and impulsivity, for this reason this may

have bad consequences in how they perform at school, how they interact with friends, and how they behave in space.

Symptoms of ADHD are variable and depend on each individual, but we know that we can group children with ADHD in three predominant types:

1. **Predominantly Inattentive**
  - Complete inaccurate or incomplete tasks;

- Have difficulty attending to conversations, activities, or tasks;
  - Be easily distracted;
  - Have difficulty in space navigation;
  - Experience difficulty in prioritizing the work and organizing tasks;
  - Frequently lose material.
2. **Predominantly Hyperactive-Impulsive**
    - Be constantly in motion;
    - Frequently fidget or move in the seat;
    - Become restless during quiet activities;
    - Interrupt others and classroom activities;
    - Be rude with adults and other children;
    - Talk excessively, and/or fail to follow classroom procedures (e.g., blurt out answers without raising hand).

3. **Combined Type**

The child shows symptoms that include behaviors from both categories.

Scientists don't completely understand the causes of the disease, by the way probably the origin of the symptoms depends on genetic factors that affect brain size, networks, neurotransmitters and brain development.

### 3.3 ADHD'S ORIGINS

Research about ADHD has conducted different neurological studies about the problem and we know that the causes are mostly genetic: the disease has origin in the brain.

There are some differences related to structure, functions, and dimensions between a typical brain and the one of of an ADHD subject. Understanding these differences is fundamental to treat the condition, to interact in an effective way with people that experience the disease and to know which tools and support can

be meaningful for their wellbeing.

Gianna Maria Frasca (Child Neuropsychiatry, expert in Autism and ADHD disorder) confirmed that other than tests made by a therapist, it's possible to make a diagnosis of ADHD through an MRI. Stimulating brain activity inducing challenging thought-related tasks or emotional situations, arise specific brain functionalities and people with ADHD present a different brain pattern from other children. Some regions of the brain are hyperactive (work more than normal), while some others are hypoactive (work less than others).

To be more precise, I will describe in detail what happens into the brain of an ADHD subject.

Our brain is divided into lobes, and each one of these sections is responsible for different functions that we are able to perform, in particular the frontal lobe is the one that contains Prefrontal Cortex (PFC) (fig. 2). This area of the brain coordinates our organization skills, planning skills, social behavior skills, paying attention, decision making, memory, problem solving, time perception and impulse control.

Into the brain then, there are "networks" that are defined as (·):

«Groups of nervous cells that transport signals through the brain.»

and "neurotransmitters", that:

«Help transmitting signals from one nerve cell to the next through networks in the brain.» (fig. 3) a relevant role in ADHD: Dopamine and Norepinephrine.

Dopamine plays a key role in movement and affects motivation, perception of reality, and the ability to experience pleasure, while Norepinephrine regulates body's stress response, sleep, alertness, and blood pressure.

To summarize, doctors and researchers

\* American Academy Of Child & Adolescent Psychiatry, ADHD & The Brain, No. 121; Available at: [https://www.aacap.org/AACAP/Families\\_and\\_Youth/Facts\\_for\\_Families/FFF-Guide/ADHD\\_and\\_the\\_Brain-121.aspx](https://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/ADHD_and_the_Brain-121.aspx)

have identified that children with ADHD have differences respect on neurotypical ones, related to:

- **The size of the Prefrontal Cortex (PFC):** their section looks smaller than the one of other children and it may take more time to develop it.
- **The networks** involved in focus, paying attention or shifting between tasks, follow different brain patterns than the ones of "normal" children.
- **The lack of neurotransmitters** of Dopamine and Norepinephrine, that affect motivation, perception of reality, and the ability to experience pleasure and body's stress response, sleep regulation, alertness, and blood pressure.

### 3.4 TREATMENTS FOR ADHD

A research conducted by Susan Young and J. Myanthy Amarasinghe, groups four existing treatments for ADHD:

- Cognitive Behavior Therapy (CBT for children);
- Behavior Parent Training (BPT);
- Behavior Classroom Management (BCM);
- Medication Therapy based on Stimulants or Non Stimulants that compensate for the lack of dopamine and norepinephrine's neurotransmitters.

It's important to add that these treatments aren't able to cure or to prevent ADHD, but could help in the management of the symptoms and in supporting people who experience the condition.

After the diagnosis of a team made of neuropsychiatrist and therapist, the treatments' combination is decided on the basis of different factors like the age of the

child, the typology and the gravity of the symptoms. Pharmacological treatments are always complementary to a comprehensive plan that includes psychological, behavioral and educational interventions: these two therapies work in parallel with the goal of controlling the symptoms and supporting the child in learning, educational and relationship's dimensions.

As Dr. Francesca Onnis (Therapist expert in autism, ADHD and communication and behavioral disorders) confirms, in Italy pharmacological treatments today are prescribed just in some critical situations with high severity of symptoms and for a short period of time (that can last maximum 2 years). Doctor Onnis, talking about her experience in the emergency ward at Pediatric Hospital Bambin Gesù in Rome, affirms:

*«There are cases that are very bad when they arrive at the hospital: children are out of control, hyperactive, rude, and parents don't recognize the situation and behave in a very dysfunctional way. This is the critical point that is not easily recoverable, and the cause is the lack of information about how to deal with ADHD. For this reason, just in these cases we give pharmacological treatments based on methylphenidate and atomoxetine in order to calm down the exasperated symptoms of the children, especially their impulsive and hyperactive behaviors. However, this is not a situation that can last more than two years, but it is helpful in order to buffer critical circumstances. It's fundamental at this point, when the children are under control, to build around them a safe environment, to educate his parents and teachers, to make them aware of the problem and to give them (and to the children, too) the correct tools to face it without panicking or going in a dysfunctional direction.»*

Medicines based on methylphenidate and atomoxetine are helpful in case of emergency but cannot last forever. ADHD condition in fact, is not something

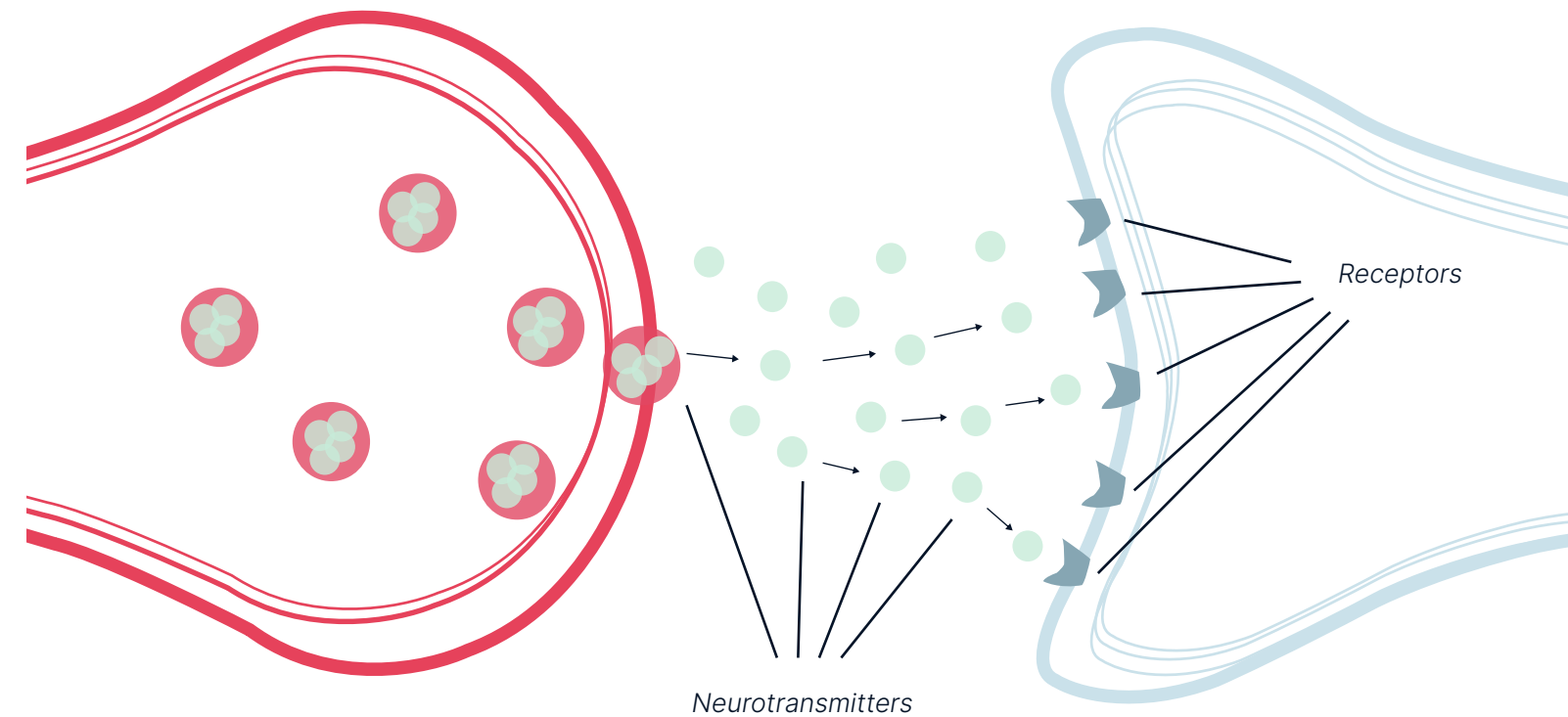


fig.3 Neurotransmitters and receptors (source: American Academy of Child and Adolescent Psychiatry)

changeable and for this reason an addiction to pharmacological treatment won't be able to solve the problem and could even worsen the case, if suspended.

Doctor Onnis adds:

*«It is essential to understand that the child is as is, and will not change thanks to medical treatments. Building an effective environment that enables free expression of his/her ways of being and giving him/her effective and personalized tools to manage by himself the stress that he experiences is the solution for his wellbeing and happiness and the achievements of his goals.»*

ADHD is a problem related to genetics and to a neurological condition that cannot be

corrected. This means that a child who experiences ADHD will never be different thanks to medication: the symptoms can ease with age but it's impossible to cure them.

It's important to proceed in a different way. Neurodiversities should be accepted and not discriminated, even because they often have a lot of strengths and special skills: for this reason it's important to give them all the tools they need to reach their goals. Finding the correct approach to interact with them and giving them all the elements they need to build relationships based on trust is the key to provide them a respectful lifestyle.



### 3.5 ADHD AT SCHOOL

The group of children that I have chosen as the interest of this thesis is the one known of the “school-age” (between 5 and 10 years old). By age 5, children start learning at school and focusing on tasks: their ability of paying attention starts playing a fundamental role and together with it, their possible frustration if they experience failures. If they are surrounded by a bad environment and their needs aren't satisfied, the risk is to have very bad consequences and bad behaviors.

Their problems related to inattention and hyperactivity, may start leading them to anxiety, loneliness and incapability to build relationships with peers, and to succeed at school. The more they feel demoralized, the more their symptoms increase.

Elementary school could represent their very first obstacle, but in some cases it could be even worse for teachers, if they aren't aware of the problem or incapable of managing the situation. For this reason, school-based classroom and academic interventions play a core role in this moment of their life.

What Wolraich & DuPaul, two veterans researchers and excellent clinicians in the field of ADHD authors, affirmed in 2010 was that academic interventions should: *«include a team approach across multiple settings, consisting of both preventive and intervention strategies. Interventions must be based upon assessment data that includes information about the student's strengths and needs as well as the environmental conditions in which her characteristics of ADHD occur. Progress monitoring and strategy adjustments are critical to the success of any intervention plan.»*

The ministerial decree released by MIUR (C.M. Prot.N. 4089 15 giugno 2010) has been the first law purpose written to support teachers in ADHD management in the classroom. In particular the decree, proposes the documents of **Airipa** (Associazione Italiana Ricerca ed Intervento nella psicopatologia dell'apprendimento), **Sinpia** (Società Italiana di Neuropsichiatria dell'infanzia e dell'adolescenza), **Aidai** (Associazione Italiana per i disturbi di attenzione, iperattività e patologie correlate) and **Aifa** (Associazione Italiana Famiglie Adhd Onlus).

All these documents contain strategies, suggestions and effective learning techniques such as visual helps, introduction of routines, shorter working sessions, small breaks during lectures, small gratifications and indications on how to set up a non-distractive work-environment: for example limiting the elements on the table or positioning the child in a desk alone close to the teacher and far from the window.

To summarize, what has been promoted in Italian schools since 2010 is a series of best practices given to the teachers that

prioritize the unicity of children's needs and strengths. These, together with a strong collaboration with the family, should represent an effective intervention for ADHD in most of the cases.

We can affirm that in the last few years, together with the growing number of children diagnosed with ADHD or other learning and behavioral disabilities, the guidelines have been implemented and updated, and the teachers are certainly more willing to adopt innovative strategies in order to build a more inclusive classroom. But the doubt is: despite the guidelines and the documents released, are we sure that the situation is really changing?

Even though the Italian situation regarding these kinds of disabilities seems to go towards better horizons and perspectives, the problem isn't so simple. The realities that concretely adopt inclusive approaches and guidelines are restricted, and often reduced to elitarian contexts like private schools or classes in public schools who have teachers who adopt an innovative approach.

There are situations like BES (Bilingual European School) in Milan, Paritarian, or Montessori Schools that have special pillars in terms of approaches that are able to address the needs of children from different perspectives: from learning, to emotions, to the furniture and the spaces. In any case, the problem is the fact that we are still analyzing private context that are really expensive and not affordable by the majority of Italian families.

The number of children with ADHD and other neurodiversities will certainly grow in the next few years, and on the other side it's growing the need of how to manage the presence of these disabilities in the context of public school.

fig.(A)



## 4. USER RESEARCH AND PROBLEM DEFINITION

### 4.1 USER-RESEARCH INTRODUCTION

During this phase of the research, I have deepened my knowledge about ADHD analyzing which are the major stress factors, the frustrations and the needs that people with this disease experience during their daily life. Then, I focused my research to the context of school, trying to have a clear idea about the critical situations and the possible solution to address them.

I have applied my skills as a researcher both in desk but also in the field. I found interesting case studies, and then I talked with experts of neurological diseases, and then with teachers and even with mums that live with their children every day and empathize with all their difficulties, struggling in finding the right way of addressing their problems.

I have explored in detail the dimensions of space, time and relationships, which play a relevant role in everyone's wellbeing and healthiness.

Each one of us could experience some of the challenges related to these dimensions, but for those who have a different brain pattern these could be amplified a lot. If the environment isn't comfortable enough or capable of hosting their characteristics, children with ADHD experience stress, anxiety, and in the worst of the cases even depression.

### 4.2 BIOLOGICAL STRESS RESPONSE: DISABLING AND ENABLING SPACES

Evidence affirms that there is a significant correlation between health and places where we live. This means that the conditions in terms of physical space seriously affect our wellbeing, sometimes even more than individual choices. For example if the quality of the air is bad, the risk of diabetes or obesity increases, while for those who are neurodivergent a bad orchestration or navigation of the

space or an auditory pollution could cause sensorial disease. In order to survive even in environments that don't address our characteristics, our body must maintain steady internal conditions, such as body temperature and fluid balance, irrespective of fluctuations in the environmental conditions.

The ability or propensity to remain in a steady state that is within our individual acceptable range is called *homeostasis* (*homo* = *same*, *stasis* = *status*). In order to maintain homeostasis, several biological and behavioral systems or 'buffers' can be employed that enable us to adapt to the change in environment. One core example could be the change in temperature or in front of external auditory or olfactory stimuli.

However, in every place and for this reason even in the school setting, the stressor elements are strictly connected even to other factors different from the space: social situations and relationships or time organization.

For those who are neurodivergent, the sensorial experience, the time perception and the social situations can be more stressful because of socio-communicative and perceptive variances, causing a repeated activation of the stress response.

A study was conducted from the British Council for Offices in May 2022, (Design for Neurodiversity ) and it provides the definitions of *disabling* and *enabling spaces* (fig.4).

Since the majority of the environments are built around the needs of "typical" people, for those who are neurodivergent these spaces result to be disabling.

A disabling environment is the one that doesn't offer adequate support to neurodiverse people, not just in terms of physical elements but also with time indicators, organization tools and relationship building. For this reason we can say that it "disables" their capabilities.

For example, if the space is decorated with many drawings and fluorescent colors, it could bother children with ADHD. Another example is: do you know what happens if children with ADHD aren't provided with ending times of when they will finish the work that they are doing? They will become stressed and will lose focus. On the other hand, an enabling space provides all users with the physiological, cognitive and psychological means to fairly participate in all aspects of daily activities.

fig. 4 Characteristics of disabling and enabling spaces (British Council for Offices, 2022)

enabling spaces pillars

**Equity.** A space that shows an understanding of the root causes that influence people's needs.

**Safety.** A space that provides a sense of psychological safety to people that they will not be made vulnerable by poor decision-making.

**Intuitive.** A space that is created with intent rather than ego, that is clear to use and that does not leave a person guessing.

**Healing.** A space that lessens the biological stress burden through the design of comforts and physical elements, ensuring environmental consistencies and freedom for all people to use the space based on their personal needs and a space that shows an understanding of how various physical comforts can support mental and physical health.

**Diverse.** A space that is agile and intentionally offers a variety of options to meet the varying cognitive demands (social, restorative, concentration) on a given day.

**Dignity.** A space that allows a person to belong, to know that they are no longer othered or made vulnerable.

**Ecological.** Design solutions should not place any further burden on the Earth's systems, and should play a role in mitigating the climate crisis.

disabling spaces consequences

- They curtail or impede the ability of the user.
- They create inequity through creating obstructions to or reducing the ability of the user.
- They create unnecessary stress for the user.
- They do not provide opportunities for self-autonomy, as they reduce choice.
- They reduce the dignity of the user, which means reducing their self-worth or value.

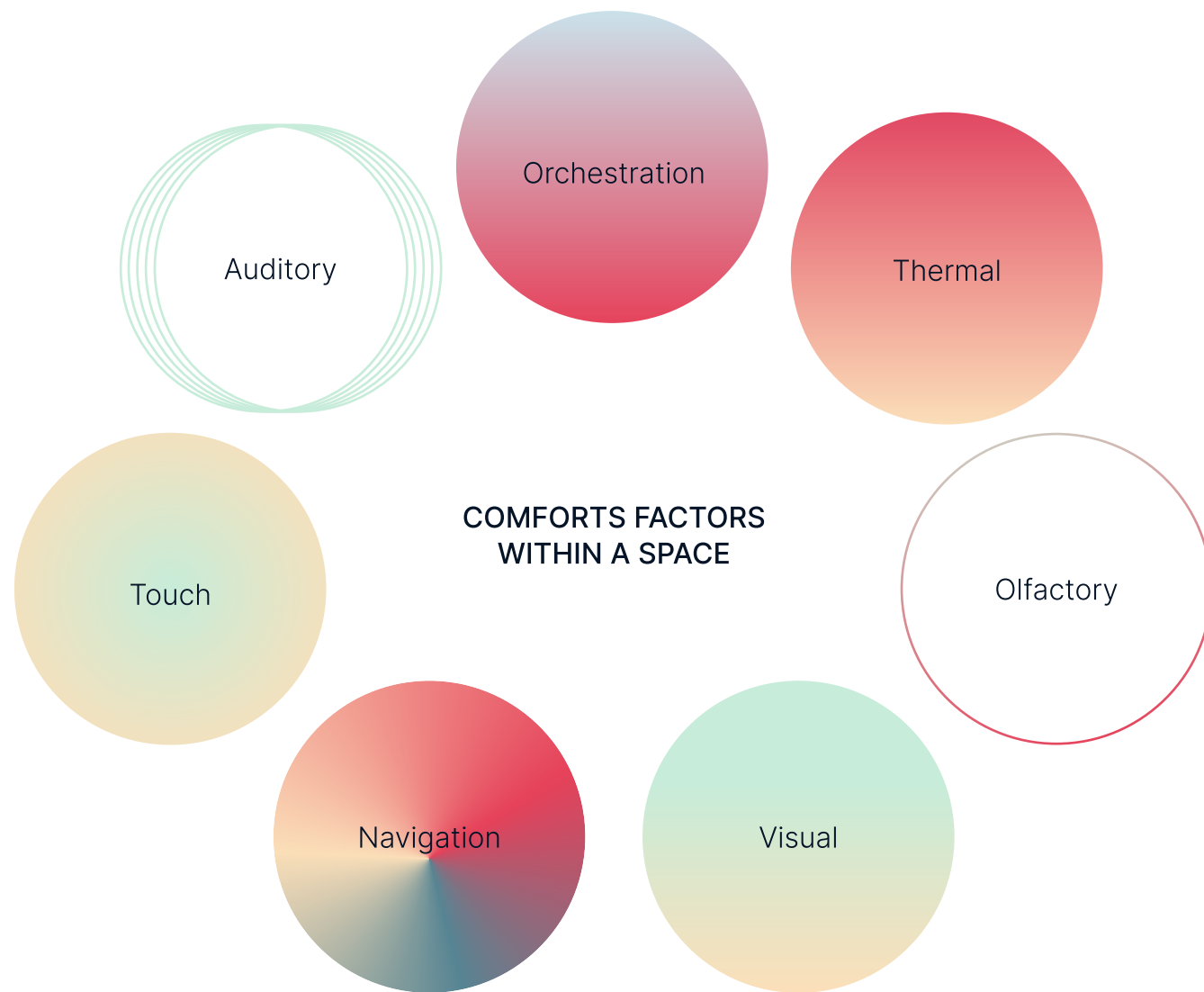


fig.5 Factors and elements that should be considered in creating a comfort space

There are different elements that should be considered in creating a comfort space, and these elements are strictly connected with sensorial perception. There are thermal, auditory, visual, olfactory, touch, navigation and orchestration factors within the environments that seriously influence the behaviors and the emotions (fig.5).

- **Thermal**: a sustained temperature that is biologically too hot or cold, or sudden temperature changes that can be perceived by a person's biological stress response as too hot or too cold.
- **Auditory**: noise pollution, which is the exposure to unnecessary or excessive auditory stimuli. This can be people speaking, sudden sounds from human activity, music, sounds from machinery, etc.
- **Visual**: there are two pathways: light and visual noise. **Light**: brightness of light sources (natural or artificial); glare on surfaces, including computer screens and walls; frequency of light; flickering light; too little light. **Visual noise**: people coming and going within the person's visual sphere of gaze; clutter, visual obstructions and poor sight lines; patterns on the walls, floor, ceiling or furniture; etc.
- **Olfactory**: there are two pathways: odours and air quality.
- **Touch**: how a surface feels to the touch in terms of both its texture and its temperature. For example, a cold surface can be biologically uncomfortable for someone with a hypersensitivity to temperature changes, or a material can cause an allergic skin reaction.
- **Navigation**: this relates to how a person moves within space. Wayfinding is a key element that can help a person feel orientated and that they belong in the space. There should be no physical obstructions, such as clutter, steep stairs, a lack of lifts or slippery surfaces. Navigation is also about space, especially for those with dyspraxia. There should be enough space for a person using physical aids to move easily, or to move their body freely and safely. Narrow paths or hallways, for example, can obstruct movement.
- **Orchestration**: the synchronicity of a space, how all the various stimuli come together to make one experience.

The comfort or discomfort of a stimulus perceived, depends on how it fits within the wider ecosystem.



### 4.3 IN THE CLASSROOM CONTEXT

Further than the spatial dimension, there are other causes of stress that children with ADHD could experience in a classroom environment. The factors that affect the most the behavior of people in a context of focus and learning in fact, are time and relationships with people.

We are gonna describe them all in detail and then summarize in the next page. (fig.6)

- **Spatial dimension (space):** as we have seen in the past paragraph, If the space presents disturbing elements that don't address their characteristics, children experience discomfort. For this reason there are some strategies teachers can adopt in order to accommodate the environment. For example using flexible seating, like wobble chairs, standing desks, footrests, seat cushions, or resistance bands on chair legs; increasing the space between desks or work tables; designate a quiet work space in the classroom; setting up preferential seating close to the teacher and/or away from high-traffic areas;
- **Timing dimension (time):** if the organization of working hours and breaks isn't clear and if doesn't respect their needs, children struggle in focusing on tasks, get distracted and aren't able to perform well. It is extremely fundamental to create accommodations in order to allow them to complete all the tasks assigned and get good results. For example posting a written schedule for daily routines and rules; when possible, letting the student know ahead of time about schedule changes; using an assignment notebook; folders and baskets of supplies to keep desk organized; creating color-code materials for each subject; providing typed notes or an outline of the lesson to help with taking notes; using graphic organizers and mind-mapping;
- **Relationship dimension (relationships):** This is a core point because everything depends on this dimension. If they are not provided by teachers of comforting elements that address their specific needs, they could experience serious problems in building healthy relationships with teachers based on trust. It's important to give directions out loud and in writing, and have the student repeat them, to provide details instructions and assignments, to keep instructions simple, clear, and concrete, to use pictures and graphs to help create visual interest to provide a rubric that describes the elements of a successfully completed assignment to help the student break long assignments into smaller chunks and to recognize the positive behaviors with reward system.

fig.(B)





fig.6 Greatest factors of stress in the classroom context



#### 4.4 STRESS-RELATIONSHIPS-TRUST CYCLE

What emerged even from the focus group with Eironwy de Mallet Morgan and Jan Holland (pp. 50-52), both teachers with more than 30 years of experience with neurodiversities, is connected to the last factor of stress in the classroom context: relationship-building. Communication and building relationships based on trust is crucial for children, because they need consistency and safety from people who surround them.

In particular, for those with ADHD, it's fundamental to build relationships with teachers that are based on information, and not on affective dimension: if their problems related to time management or spatial navigation will be correctly managed by the teacher, they will be able to succeed in relationships even with companions.

A clear example could be a teacher who is faithful to children's time management issues: if she is able to provide the child with all the duration of the activity and a knowledge of what will be the next one, he won't experience stress and will be able to trust her. We could call it a *cycle*, since every step is consequent to the other. (fig.7)

##### Negative cycle

1. Stress experienced through time and space dimensions;
2. Teachers aren't able to provide the information and to create an enabling space;
3. Level of stress increases, they become impulsive and rude because they don't trust adults;
4. They aren't capable of building safe relationships with peers.

##### Positive cycle

1. Stress experienced through time and space dimensions;
2. Teachers are able to provide the information and to create an enabling space;
3. The needs of the children are addressed, they can relax;
4. They are able to build safe relationships even with companions.

We could affirm that for all the children, especially for the ones with ADHD, the ability to make friends and to establish healthy relationships, depends a lot on the capacity of the teacher of creating an *enabling space* addressing the spacing and timing needs.

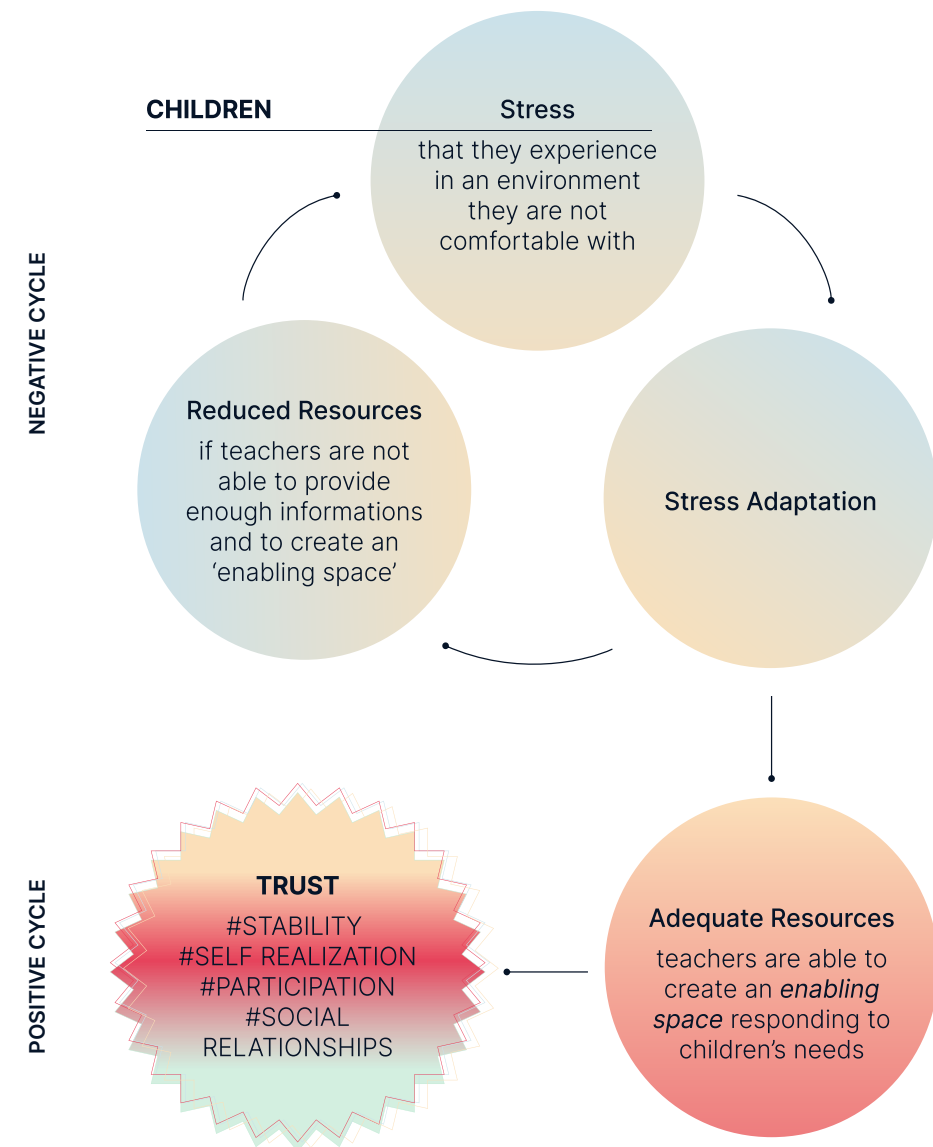


fig.7 Stress-Relationships-Trust cycle

## 4.5 CASE STUDIES



### Understood.com, a digital platform for those who learn and think differently

Understood (\*) is a digital platform that offers a service to support those who think and learn differently. The website helps them, their family or their educators to discover their potential, to learn how to take control, to find a community and to stay on positive paths along each stage of life's journey. It offers articles with general or specific knowledge about differences for allowing the supporters to understand and embrace them and for helping those who need to not feel alone. It also contains suggestions with the right information to change behavior and learn positive attitude. The scope of Understood is promoting equality and creating an inclusive community.

#### Why is it interesting?

Understood is an interesting example of a platform dedicated to inclusivity. It's interesting observing how they have been able to design a website with so many contents related to how to support and facilitate lives of those who think and learn differently. It also communicates a strong sense of community and helps those people feel less alone.

#### Keywords

#neurodiversities, #community, #support, #family, #school

\* <https://www.understood.org/>

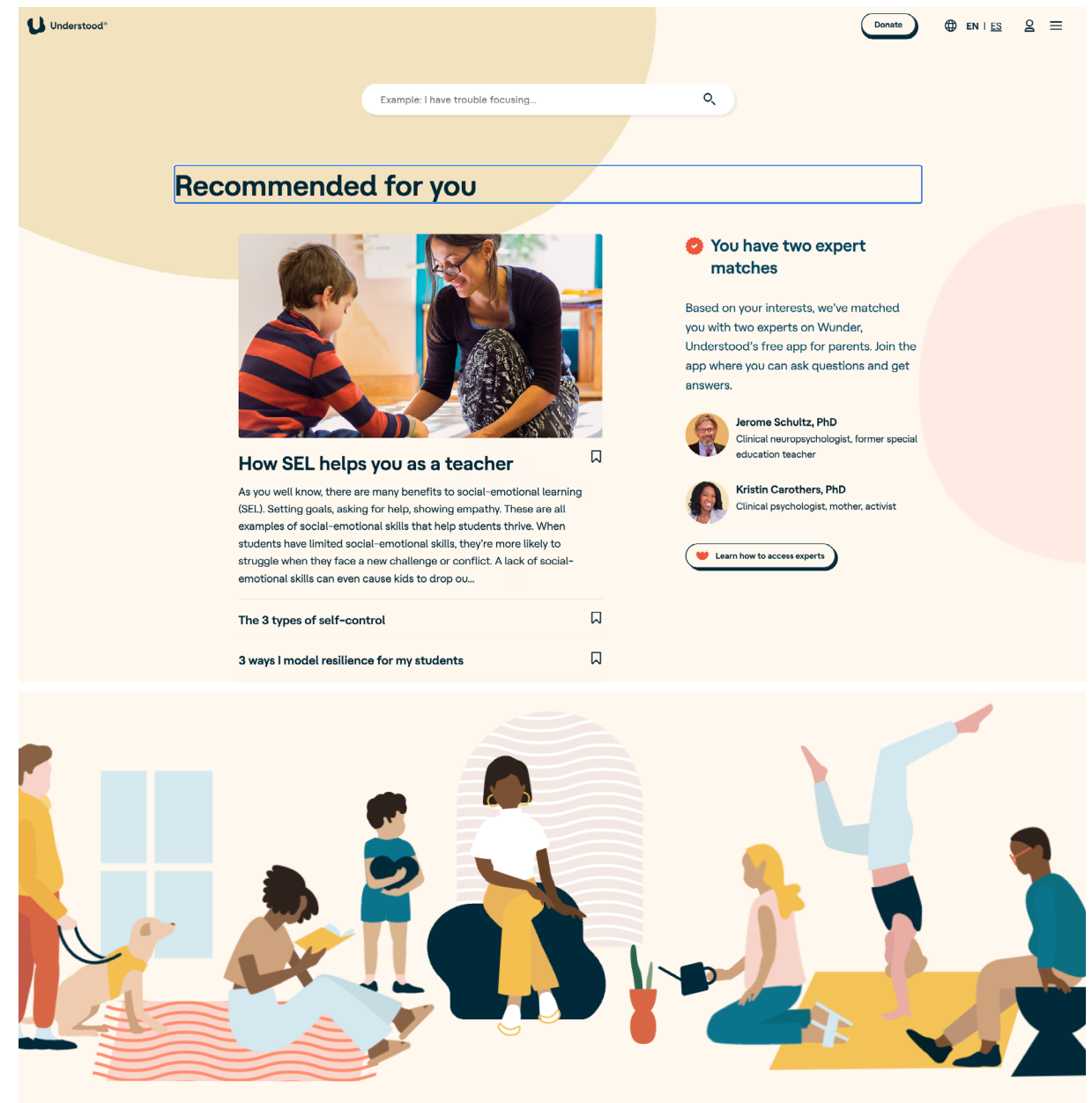


fig.(C)

b.

**Digital Attitude, a way to facilitate the daily work through behavioral change**

hi (habit-inspiring platform)(<sup>1</sup>), is a service that has been proposed by Digital Attitude in the context of the Collaboration & New Ways of Working Global Adoption (M365 & Digital Platform) project , finalist at the Digital360 Awards 2021 for the Smart Working and Collaboration category. It was the answer to the need of many companies to have a unique solution to combine training, learning and behavioral change objectives on topics and contents related to the new ways of working.

The algorithm underlying hi (habit-inspiring platform) is designed on the behavioral model of habits proposed by Charles Duhigg, journalist and author of the essay *The power of habits*, which states that to determine a new behavior, it is necessary to “install” a new habit through repeated actions. hi exploits this scientific theory by translating it into an algorithm that influences the behavior of users with a personalized coaching guide, which can be used in real time. It operates with usage models based on data and on the specific architecture of the tool that the user desires in total respect of privacy and personal data. Everything is translated on the platform in the components of the tips, of the nudge and of a digital dashboard.

**Why is it interesting?**

hi is an interesting example of a method that has the scope to change an environment through simple actions in order to make it more comfortable for people and to improve their performances at work. hi teaches us how it’s possible to make the working environment a safer and enabling context through simple but meaningful actions related to organization and planning dimensions. In particular the method of nudging and the to do lists are fundamental for supporting the needs of people with ADHD at work or at school.

**Keywords** #behavior-change, #nudging, #planning, #building-habits

<sup>1</sup> <https://www.habitinspiringplatform.com/>

**Habit-Inspiring Platform**

The unconventional solution for your digital evolution

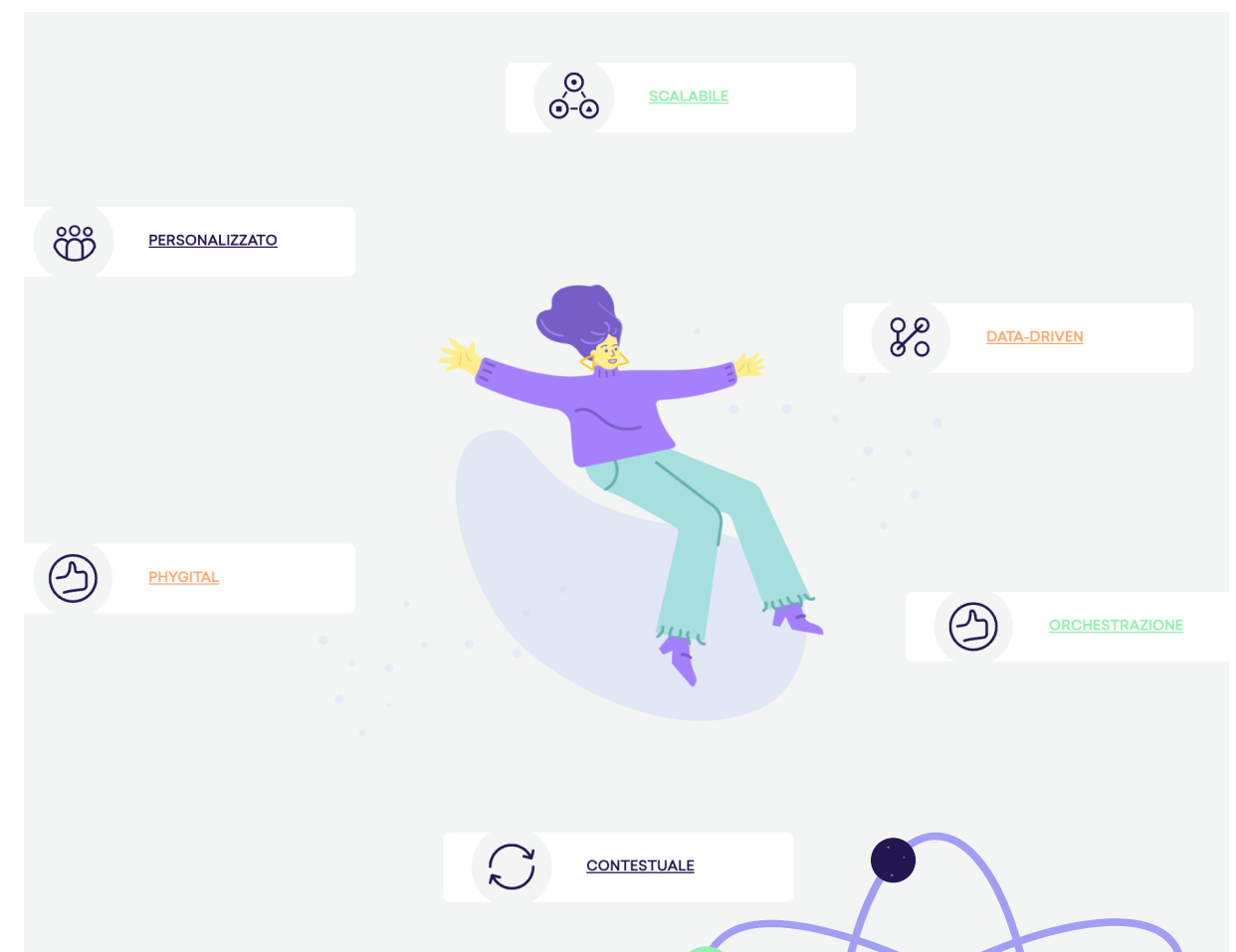
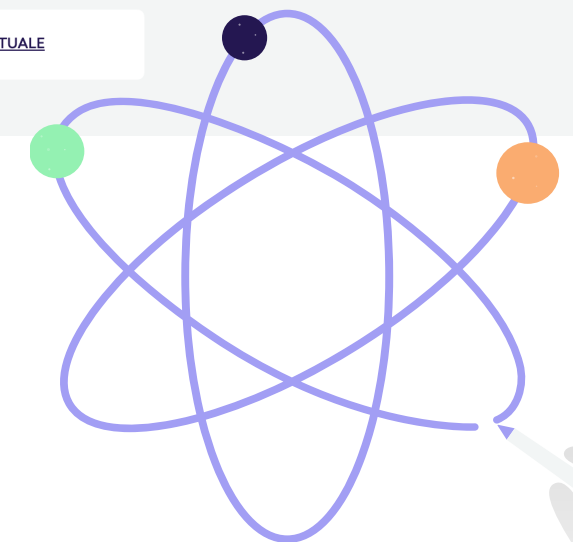


fig.(D)





# C.

## BES, the school that addresses the needs of each child

British American Pre-School and the Bilingual European School (\*), offers an interior and exterior learning landscape where the students are free to trace their own journey through the school every day.

Rosan Bosch is the architect who interpreted in her interior design the most innovative international teaching theories for the students, teachers and parents of BES. It is important to talk about architecture in relation to school because the creation of creative environments, encourages and motivates students to choose the spaces in which to carry out the didactic activities, according to the curricular objectives, the playful activities and to explore new horizons.

The learning approach is constructivist (learning by doing), and they strongly support the idea that every child is unique and special. The peculiarity of the school is to support their unique talents and help them in training personal resources for furthering growth and development. They allow the students to grow and develop in the knowledge that every person connected with the school is recognized as a valued member of the school community and has a duty to work to the best of his/her ability in order to realize his/her unique potential as a happy, caring and talented individual.

### Why is it interesting?

BES school is interesting for two main reasons. Firstly, the attention to the space and the furniture, that is coherent with the didactic approach and goes in the direction of creating comfort and enabling spaces for each kind of neurodivergency. Secondly, for the user-centered approach: everything is built around children's needs, to support their strengths and to address their frustrations.

### Keywords

#inclusivity, #accessiblefurniture, #comfortspace, #enablingcreativity, #strenghtdifferences

\* <https://www.beschool.eu/it/chi-siamo/benvenuti-alla-bes>



fig. (E);(F);(G);(H);(I)



d.

### Anastasis a service that offers compensatory softwares to support neurodivergencies at school

Anastasis.com (\*) offers a series of diverse technological softwares, courses and services that are addressed to DSA, BES, ADHD and other learning disorders, for autonomy.

The compensatory tools allow students with SDL and other disabilities to learn and study effectively, also thanks to features that foster multichannel learning including:

- **Speech synthesis** and tools such as OCR to transform the texts of paper books into digital texts, readable by speech synthesis.
- **Concept maps**, which allow ideas to be elaborated also with images, videos and other digital resources.
- **Word processing programs** with spell checker and other support functions.
- **Calculator and math programs** (editors) that help avoid copying errors and support effective math writing.
- **Dedicated image libraries** and integrated tools for searching images and other information on the internet.

#### Why is it interesting?

Anastasis offers an interesting set of technological elements and useful methods that are built to support children in learning. These technological elements, play a fundamental role in teenagers and kids' learning environment reducing the stress and the frustrations.

#### Keywords

#inclusivity, #accessiblefurniture, #comfortspace, #enablingcreativity, #strenghtendifferences

\* <https://www.anastasis.it/strumenti-compensativi/>

fig. (L)

USER RESEARCH AND PROBLEM DEFINITION

<b>Kit compensativi ePico! – Matematica e SuperMappe</b> Da €85,00	<b>Geco</b> Software per l'apprendimento Da €64,00	<b>GECO BES</b> Sistema integrato per l'apprendimento area BES
<b>ePico!</b> Software compensativo Da €49,00	<b>ePico Map + USB</b> Software su chiave USB Da €275,00	<b>SuperMappe</b> Software per creare mappe multimediali Da €29,00
<b>MateMitica</b> Editor digitale di matematica Da €19,00	<b>SuperMappeX Educational – abbonamento annuale</b> Mappe concettuali online per la classe Da €79,00	<b>SuperMappeX privati – abbonamento annuale</b> Mappe multimediali online €42,99
<b>Pacchetto scansioni OCR</b> Pacchetto aggiuntivo €9,00	<b>OCR Anastasis</b> Software per il riconoscimento ottico del Testo €61,00	<b>SuperQuaderno</b> Editor per l'apprendimento Da €159,00
<b>Personal Reader</b> Lettore USB di testi digitali Da €172,00	<b>Personal Reader MAP+</b> Lettore USB di testi digitali Da €250,00	<b>Carlo Mobile PRO</b> Software per lettura e studio Da €159,00
<b>TeacherMappe USB</b> Software USB, supporta la didattica €144,00	<b>SuperMappe EVO</b> Software per creare mappe multimediali	<b>SuperMappe Classic</b> Software per mappe multimediali, scuola primaria €96,00

#### 4.6 FOCUS GROUP

I organized a focus group with a therapist and a neuropsychiatrist who both work with children with ADHD, and I interviewed them in order to collect more insights related to the specific behaviors of these children and the challenges that they experience everyday.

##### Therapist and Neuropsychiatrist: Francesca Onnis and Gianna Maria Frasca

**Name** Francesca Onnis

**Profession** Clinic psychologist, expert in teenagers and kids, expert in autism, learning, communication and behavioral disorders

**Where?** Studio Amadei (Paderno Dugnano)

**Name** Gianna Maria Frasca

**Profession** Pediatric neuropsychiatry medical director

**Where?** ASST - Hospital of Desio (Monza Brianza)

##### Q&A

**Me:** Can you tell me what is ADHD? (Definition and causes)

**Francesca and Gianna:** ADHD Is a developmental disease experienced by many children that have many difficulties in focusing on tasks, time perception, controlling impulsive behaviors, controlling hyperactive behaviors.

Prefrontal cortex is the last part of the brain that develops: it continues growing until we are 25 y.o., for this reason we can train it and improve it year by year. In children with ADHD this part is smaller than in other children.

ADHD causes are genetic but they are strongly influenced by the environment: some children have predisposition to develop this problem and it can get worse because of the environment (family problems, disorders, bad environment, maltreatments).

Geneticity is important but a bad environment is a fundamental

component for kids' wellness!

**Remember that ADHD isn't a disease, it is a condition: if you are in a system that doesn't consider your characteristics, you can develop a problem.**

The worse is the ADHD, higher are the symptoms, there are surveys that allow to understand if a child is affected by ADHD. (No one uses MRI). Therapists should notice the child's relational problems at least in 2 contexts: school and family.

**Me:** Which are the symptoms of ADHD? Can you provide me some examples?

**Francesca:** Children with ADHD can't get bored: they can't do something that lasts for a long time without more than 1 stimuli. ex studying a chapter of a book. Remember that there are 3 types (distracted, hyperactive and both of them), sometimes the hyperactive can become just distractive if the problem is not taken care of.

Hyperfocus is a condition that some ADHD children could experience just when they have an external regulator (ex video games, the videogames are able to create a regulation/focus, when the focus should come from themselves they are not able to keep it high). When they have external stimuli they are able to stay focused for a long long time: they can be extremely good at video games!

**Gianna:** Something very good for them

(they need more stimuli because otherwise they are not able to focus on one thing like for ex listening the professor) is for example drawing while they are listening to the teacher, this helps them to address and to satisfy all the stimuli and to address their attention to the lecture (doing double work).

There are also some special chairs or furniture that are built for children with ADHD and that address their need to move.

**Me:** Can you describe me the medical treatments? When are they used and in which cases?

**Francesca:** There are cases that are very bad when they arrive at the hospital: children are out of control, they live in a bad environment, parents have ADHD themselves or they aren't able to manage the situation. Children are rude and out of control, parents are desperate: it's impossible to do parent training in these situations.

**Gianna:** Thanks to medical treatments the child is calmed (treatments last for more or less 2 years) and when the child is calmed it is possible to integrate and support with therapy and efficient programs.

**Francesca:** Everything is about relationships: building an effective environment is possible at this point through relationships because the child has been calmed down by a medical treatment.

**Me:** *What could be in your opinion the most effective service to help ADHD patients and support their families?*

**Francesca:** *What works with ADHD children (from primary to high school to university) is to create a work/study environment where they can use different tools and techniques to learn how to study (Anastasis case study).*

*These virtual spaces are softwares should be a mix of:*

- *Tips, reminders, visual trackers, digital coaches, nudging, rewards system (that right now are built in paper);*
- *Agenda, planning;*
- *Tools to create maps, visual connections, concept mapping;*
- *Tools to merge pdfs and having vocal reading.*

*At the moment these tools exist but are all separated, a service that could connect everything could be useful. **If these softwares for learning are well done, they could work also for normal people, the more specific they are, the more they can be adapted to ADHD.** At the moment some softwares exist but for children with DSA, for ADHD these still don't exist*

*These softwares should be*

- *For children;*
- *Should have the possibility to be regulated/monitored by adults (not just by machine learning) because human mind is the best moderator;*
- *Should be highly interactive, because for these children the power of learning by doing is extremely important;*
- *Should address all the stimuli they need.*



#### 4.7 SEMI-STRUCTURED INTERVIEWS

I had the chance to have conversations with teachers and parents that are close to the topic of neurodiversities during these months of research, but even during the toolkit definition. With some of them I had more than one meeting, because I felt the need to iterate and to ask for their opinion more than one time, and even because I sincerely cared about their personal opinion on my work.

# 1.

#### Teachers: Eironwy de Mallet Morgan & Janet Leigh Holland

Eironwy de Mallet Morgan (MCSP, MA in Education, certified teacher now retired) and Janet Leigh Holland (MA in Education, certified teacher now retired) are ex teachers who have a huge experience of working in schools with neurodiverse children. They have also been to BES school (Milano) to support the teachers with their method. I have asked a second meeting with them because to hear from their opinion was extremely useful for me, and it contributed a lot to open up my mind and my personal point of view on the topic. They helped me also to identify the correlation between elements of stress, frustrations and needs of children with ADHD. It was a semi structured interview that ended in an inspiring conversation.

**Name** Eironwi de Mallet Morgan

**Profession** Primary school teacher, MCSP, MA in Education, certified teacher now retired

**Name** Janet Leigh Holland

**Profession** Primary school teacher, MA in Education, certified teacher now retired

#### Q&A

**Me:** *Firstly I would like to introduce the work I have done till this moment for my thesis and then I would like to hear from your personal experience what is your personal perspective related to neurodiversities...*

**Eironwy:** *Dear Mariella, personally I could probably look radical, but I have to tell you the truth about what is our point of view related to ADHD. We think the most important thing is to stop calling it with the name "ADHD" and with the word "disease", since the very first rule to avoid diversities is to stop calling them as if these diversities exist. **Just the word that you used "disease" and "problem" is wrong in our opinion, because it implies a difference, and if people won't stop using these words to describe ADHD the real inclusivity will never be reached.** I personally have ADHD, I discovered it late with the ages, but I have never treated children who suffered of the same difficulties as they were "sick", **they have just different needs and times and they have to learn how to use their skills at best in order to reach the same goals of others.** It doesn't mean that they can't do it, they can do it but in a different way! One day a child came to me telling that she «couldn't read because she had a disease», because her parents insisted a lot on this point and treated her as she was sick. I told her that she was exactly as the others instead, and I started teaching her how to read «You can do it exactly as the others do. Let's try, one word per time, step by step, one page per day...» Taking her time, she learnt how to read all the book. Another thing that I would like to add is that every solution that we design and think addressing the needs of people who might experience some problems, have a very positive impact even for other children. For example, **giving a visual indication of time, hours, and activities to do is something***

**that we don't do for autistic children or for children with ADHD, but for all the class. Everyone of us needs lists, needs to know what he has done and what he should do.** We should stop treating others as if they were different, we should just start improving the world and the context where we live by adding valuable solutions that could benefit everyone.

**Me:** *What do you think about creating a toolkit for each child who experiences ADHD? What could be useful in your opinion for the teachers in class?*

**Janet:** *If I could answer your questions, the most important thing for neurodiverse children is to establish relationships with people. They have to **trust people** before doing anything else, because **if they don't trust, they aren't able to build relationships and they become aggressive, impulsive, anxious and stressed.***

**Children need a teacher who funds the roots of her relationships with them on information:** *she should provide the correct information related to time and things to do, because they need a time reference and they need to know what they will do in the future and for how long they will do it. It doesn't matter if the teacher is sweet and affective or rude, the most important thing is information. If children are addressed on this need, they feel more comfortable even with the rest of the class, and they start feeling less anxious.*

**Me:** *What do you think about exclusion? How is inclusion possible in a class of 30 children?*

**Eironwy:** *I think that everything starts from teachers. Teachers should stop being the first to exclude children who are seen as diverse, otherwise even the other children will start excluding them!*

*For example: if a teacher decides that a child should sit close to her desk because otherwise he won't be capable to focus on the lectures, she fosters the exclusion of the companions. All the class will think «Look, that child is different. He has problems...» and the situation could just get worse. If only teachers could do something like changing the desks' disposition in circle or U shapes, they will promote face-to-face interactions between children. If teachers would provide clear indications of timing of work and timing of playing, all the children would be capable to focus more.*

**Me:** *What do you think should be done in order to promote inclusivity in the context classroom?*

**Eironwy:** *As I said before, **everything starts from teachers**. Teachers should be able to do 2 important things: to establish relationships with children and to communicate the time dimensions.*

*If only all the teachers of the world would be able to do this, all the children could benefit from school context and learn better.*

## 2.

### Teachers: Cecilia Picinini & Germana Tomatis

Cecilia and Germana are two expert teacher of BES School in Milan. Founded in 1999 as a natural continuation of the British American Pre-School, BES is an institution with solid foundation that keeps a constant eye toward staying abreast of current research in education and is committed to seeking excellence in teaching and learning.

**Name** Cecilia Picinini

**Profession** CST & Primary School Coordinator at BES (Bilingual European School)

**Name** Germana Tomatis

**Profession** Psychomotricist, expert in emotional Psychomotricity at BES (Bilingual European School)

### Q&A

**Me:** *Can you introduce me to the BES School in Milan?*

**Cecilia:** *BES is a bilingual school in Milan with a social-constructivist approach. Learning takes place through teacher-led experience and children's knowledge is constructed together with them. The approach is transdisciplinary (6 disciplines in total that carry through all five years). The study that has been done within the BES spaces is remarkable: furniture (from the BOSCH company) has been made with spaces created with natural and curvy shapes, clear in/out accesses, large windows, relationships spaces, communication spaces. Children need to know that they can move freely within that space and use its elements, they need to symbolize and take elements from each parameter they have within the spaces in order to express themselves. Furthermore, they are helped and **use checklists a lot to have predictability about the future, and to have access to the past**. All these activities must be in shared agreement between child - school - family. These Checklists take different forms depending on the child and his needs: the work is always personalized.*

**Germana:** *It is important to consider 3 dimensions of space:*

1. **Bodily Space.** *The body speaks, makes children protagonists and interpreters of how they want to build the space based on their personal experiences. It is necessary to start from the body, from the sensations the body has to represent the state of mind. If children are able to separate the body (being masters of it) from the actions, they can ask for help in a variety of forms, and teachers can understand and address the request.*
2. **Social Space.**
3. **Architectural Space.** *The architectural*

*structure that surrounds the children has to be combined with activities that can help them to manage the focus.*

**Me:** *What do you think about the Bag/ Toolkit? Could it be important in your opinion for reducing stress in child's daily life at school? Which should be the requirements that the bag should have?*

**Cecilia and Germana:** *It is possible and interesting to create a child-friendly "bag" that can bring continuity in relational, spatial and temporal dimensions and that can grant them tools to communicate or connect with school reality and home/family reality. However, it is necessary to take in consideration that these requirements:*

- *It should be composed by some "standard elements" and activities but it is important that the toolkit will be highly personalized and entirely built on each child's needs, reflecting his experience and elements known to him so that it can be effectively internalized and used. (e.g., if the child does soccer/skateboard/singing, elements and tools that relate him/her back to these areas.*
- *The child needs to fully own the tool so that it can be helpful to him as a support.*
- *The toolkit (or bag) must be built together with family, therapist and school within a safe context by placing the child at the center of a safe space. Once this is internalized, known, understood and experienced by the child it can also be adopted in other spaces/contexts*
- *It must also be customizable in terms of senses (both tactile, auditory, and olfactory e.g., handkerchief with scent that reminds of mom lets teachers know that the child is thinking of her, communicates this and is easier to manage)*

*It is important to know also that teachers are trained to manage stress of children. They know that it is a situation that they have to experience. They understand the stress and they always account for it, they experience it. They should be helped in reducing at minimum stressful situations.*

### 3.

#### Teacher: Cristina Beretta

Cristina has studied in Primary Education Sciences at Bicocca University (Milano). During the five years of university she did many internships in different Italian schools. The last one she decided to fly to Oslo for six months for Erasmus and she fell in love with the Norwegian way of teaching. When she came back to Italy, she did another internship at BES school in Milan. In the thesis she decided to compare the BES school methodology with the school she had visited in Oslo. Once graduated, she worked in a bilingual school in Monza for 4 years, then in an international school in Vedano al Lambro for one year.

Currently for her this is the first year of teaching in a public primary school (Aldo Moro, Seregno).

Cristina has a varied background and she had many enriching experiences, that made her curriculum varide and her method very interesting and inclusive. She is the teacher who accepted to participate to the experimentation of the thesis.

She is young and talented, however she is still looking for new approaches, methodologies, tools and suggestions about how to change the traditional Italian school system, but it's not easy at all.

**Name** Cristina Beretta

**Profession** Primary School Teacher at Aldo Moro Primary School, Seregno (MB)

#### Q&A

**Me:** Can you introduce me to the BES School How would you describe your approach as an inclusive teacher?

**Cristina:** Firstly, I would like to say that I don't follow any radical school. I would like to describe my experience as hybrid, because I always tried to take the best from the contexts I have lived in, (especially the private ones and the norwegian school) and to bring them with me along the path. Now that I will experience the context of public school I would like to bring a bit of freshness. Unfortunately what is missing in public school is a clear direction and every teacher teaches as she/he knows, in a pretty traditional way that comes from cultural heritage. I had the chance to discover effective and innovative perspectives and ways of teaching: I think that something in public school should change and go in a more inclusive direction..

In the Paritarian school I appreciated the methodology a lot because they have experts in psychotherapy and speech therapy that are available for children whenever they need support. The experts help giving directions to teachers about how to deal with specific situations, but also help the kids if they need a period of therapy. The most important thing is always to explain to the class what happens. It's important to tell the class that children who need therapy are not different of ill, they just need extra support in this moment. Remember that if we speak with children, they understand and start normalizing situations.

**Me:** Which are the core pillars of your method?

**Cristina:** My first cardinal principle is the care of children (they should always be at the center of any decision), I always ask for their opinion and what they think about the solutions I propose to them. For example,

*if I have a child who experiences some diseases in reading I talk to him telling "I've noticed that you are a bit anxious regarding reading, I would like to propose you this solution: let's try to do some exercise with the speech therapist, she will help you and you will feel better, what do you think?". I have noticed that asking to the children what they think about solutions that you propose to them, is extremely important because in this way they feel involved and considered. After showing them that you care about their opinion, they feel open to be helped from whatever you propose to them.*

*The second important point that I bring with me is that I often leave children the chance to choose the methodology that better suits their personality in order to reach a common goal. For example, if the common goal is to learn how to count progressively, the activity I do with them is to prepare tables with different methods to reach the same goal (for example in the first they count with abaco, in the second they write on paper, in the third they count with legos, in the fourth they move some post its on a board, in the fifth they move around the space...). They have to try all the methods, because they are children and it is important that they could see different perspectives, but in the end they have the chance to tell the method they have preferred. In this way they learn that there's not right or wrong, they are just different but they learn exactly the same goal. Another example is: I give to my children the homework to tell the story that they prefer, with the methodology they prefer (someone writes and then reads with emphasis, someone moves around the space, someone sings, someone dances...) and then everyone listens to the story of the others.*

**Me:** Do you think that the toolkit is

something that could have a positive impact? Why? Do you have suggestions in mind?

**Cristina:** I think that it would help a lot of teachers.

What teachers need is to have guidelines and practical examples about what they have to do in class: they know the theory but they don't know how to apply the theory concretely, and for this reason they don't know how to be innovative. I think that it's a wonderful idea and it would help a lot, since there are every day more cases of children who are experiencing difficult times and teachers need a support in knowing how to manage the situations at best. I think that the guidelines should be built by a therapist, a teacher, a speech therapist, a psychomotricity expert and even by an interior designer who has expertise in accessibility and inclusivity. With this team a very well defined service could be built for teachers and it could be introduced in the school directly by the dirigent.

**Me:** Why do you suggest a speech therapist?

**Cristina:** Because I think that a speech therapist has a great knowledge about the connections between thoughts and communication, that is something very important for children at that age. If they aren't able to express well what they have in mind (especially in writing but even in other situations...) a path with the speech expert is something useful in order to give them the possibility to improve this condition..

## 4.

### Parent of a child with ADHD: Sarah Ables

**Name** Sarah Ables

**Profession** UX Design Manager at Wizards of the Coast, mum of a child autistic and with ADHD

### Q&A

**Sarah:** After listening for the toolkit idea, Sarah speaks about her experience as mum: My son has grown up now, he is 17. He has gone to a Montessori school. I know that there are not many realities apart from these approaches that are for sure better than traditional school, but are even really expensive and a bit radical. If only there would have been another option I would have considered it for sure. My son was seriously psychological abused. He suffered a lot at school, crying because he should do his homeworks, and he felt incredibly alone. I think that what you say about trust is meaningful: all the kids need trust. They need trust and consistency, they need to find safety in routines, just in this way they are able to stop stressing themselves. Consistency is important for safety.

**Me:** What do you think about a toolkit built for kids and made for them in order to build a safe space around them?

**Sarah:** I think that safety is important, it is a good idea and for my son I would put soft covers, perfumes, games, animals, objects that they use to bring with themselves and to communicate safeness and comfort. It's essential to bring consistency. I also think that building activities and elements together with children is an important practice to avoid the feeling that something is imposed on them. They should be free and happy to constantly

live routines, children are not able to communicate, so there should be someone who is constantly able to prompt them and to involve them.

**Me:** What would you change in the school to make it better?

**Sarah:** I would love to have a school where my son shouldn't do that damn homeworks everyday, but where he could experiment in open spaces, with the reality, in the contexts. I think there should be a way to normalize these contexts and situations of exploration. I think there should be a way to learn for them that is more practical and active than just the mere learning and exercising memory. I would like a school where experiencing and experimenting could become normal, and essential to learning.



#### 4.8 INSIGHTS CLUSTERING AND RESEARCH QUESTION

After a deep desk and field research session, I collected all the insights related to the topic of neurodiversities, ADHD, and current situation in Italian public primary schools.

I had further passionate discussions about the insights even together with parents of children with ADHD (in particular Sarah Ables and Valeria Della Rosa), but even with other teachers external from the ones that I had interviewed (like my parents, who both teach in high school).

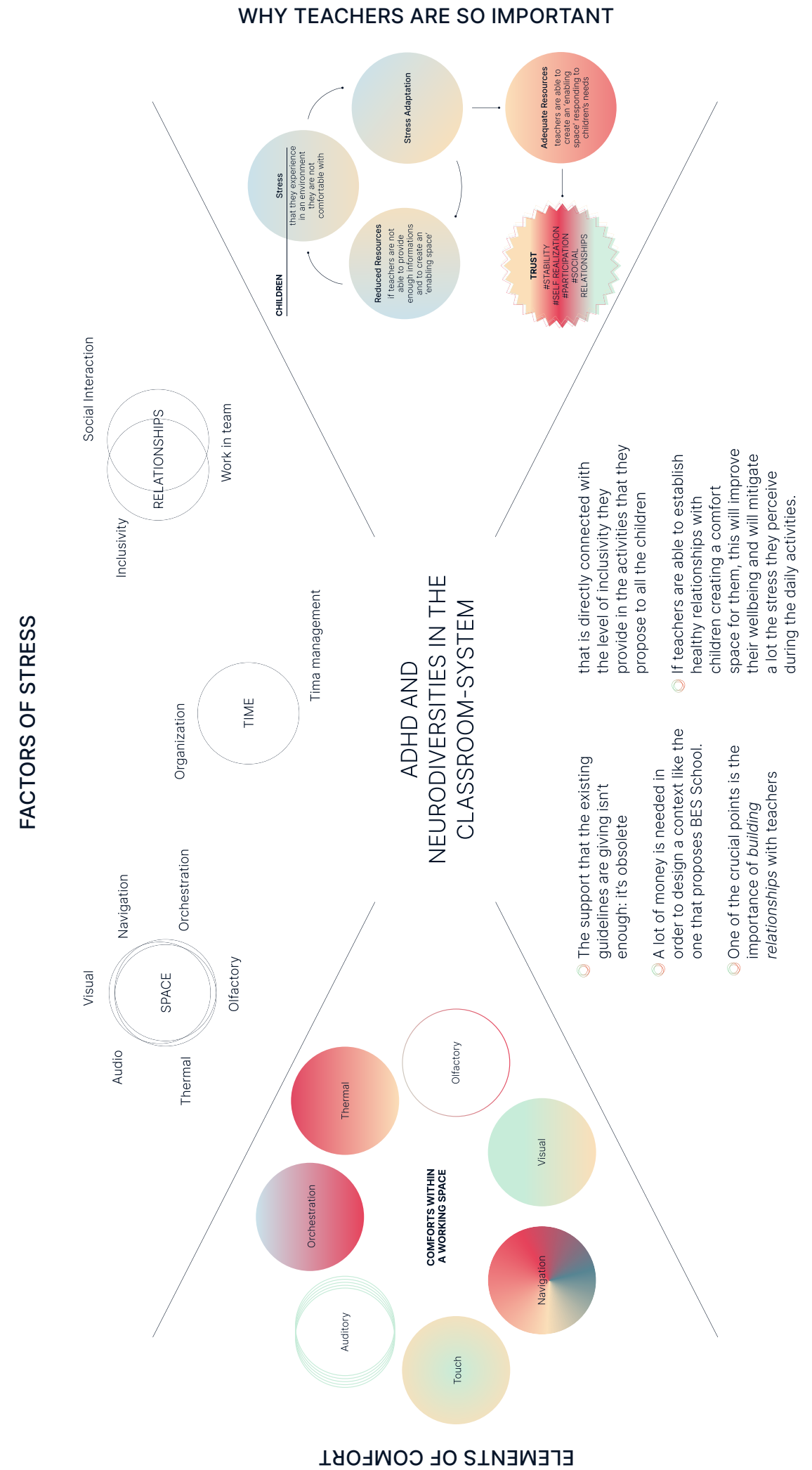
They have helped me a lot in understanding that:

- **The support** that the existing guidelines are giving **isn't enough**, and what exists is obsolete, but on the other side a lot of money is needed in order to design a context like the one that proposes BES School.
- One of the crucial points is the **importance of building relationships with teachers** that is directly connected with the level of information they provide during the normal classes and activities that they propose to all the children.
- If teachers are able to establish healthy relationships with children **creating a comfort space** for them, this will improve their wellbeing and will mitigate a lot the stress they perceive during the daily activities.

The insights (fig.8) at this point drove me towards the directions of framing the research questions and to start exploring the possibilities in terms of Service Design in order to give my contribution to support the classroom-system of a public school and to make the context more inclusive and healthy for each individual:

“**How might we help teachers of primary school creating a more inclusive and comfortable classroom-system exploring the dimensions of space, time and relationships?**”

fig.8 Insight map



## 5. EXPLORING OPPORTUNITIES

### 5.1 HOW MIGHT WE...?

We have analyzed throughout all the research the core problems and frustrations experienced by children and teachers of primary school in the context class. The assumptions have bring us towards clear insights that have allowed us to define the problem and the main research question: *How might we help teachers of primary school creating a more inclusive and comfortable classroom-system exploring the dimensions of space, time and relationships?* (p.58)

At this point, I have started a focused research about which interesting opportunities exist in terms of methodologies and case studies that could support me during the concept generation phase. I found three approaches that attracted me a lot, referred to different aspects of the problem.

In particular, the evidence, helped me to contextualize the situation, addressing the problems from different perspectives:

- The **definition of a target user** was fundamental: should we create a solution to support the teachers just to address the needs of the kids who experience specific problems or for all the class?
- The topic of the **content definition**: Which kind of contents should we provide to the teachers? Which should the level of interaction be?
- The **principles** that could support us in the service creation: Which principles should we keep in mind to protect children's rights?

Thanks to this iteration and further reaserch about Service Design opportunities, it was possible to build step by step a strong concept and service, prototyped and experimented in a real classroom of primary school.

## 5.2 SOME INTERESTING APPROACHES

I explored into further case studies related to approaches and methodologies that could become interesting opportunities and could inspire me in the implementation of different aspects of the service that I developed.

# 1.

### How Participatory Design for Autistic children can benefit a broader child population?

TEACCH (Treatment and Education of Autistic and Communication related handicapped Children) is an evidence-based approach for teaching individuals of all ages and skill levels with autism spectrum disorders.

It was developed in North Carolina in the early 1970s by Eric Schopler and colleagues. It is a method that is based on the research about autistic children who are predominantly visual learners, so intervention strategies focus on physical and visual structure, schedules, work systems and task organization. At the core of this approach there are three pillars: physical organization, scheduling and teaching methods.

A study was conducted in 2014 in the University of Bath by Laura Benton and Hilary Johnson. It was based on the fact that **technology products created to overcome accessibility and usability issues experienced by individuals with special needs have also resulted in greater usability for the wider population.**

The aim of the research was to investigate the potential benefits of using a structured and supportive participatory design (PD) approach and the method of TEACCH, tailored to the specific needs of children with Autism Spectrum Disorders (ASD), for mainstream schoolchildren.

This approach was trialed with four design teams, two teams including children with ASD and two teams including mainstream schoolchildren. They were asked to develop a mathematics game over a series of six design sessions following the IDEAS approach. The findings revealed that a well defined Participatory Design approach can benefit both children with ASD and mainstream children. However, these benefits varied between and within different groups, with some children requiring the additional structure/support more than others.



fig.(M)

#### Why is it interesting?

This is a meaningful case study because it shows how solutions that address people with specific needs can become valuable and useful for everyone.

It reminded me what came up from the interview with Eironwy and Janet and it helped me a lot to understand which was the real target of my service: if we really would create an inclusive environment we should be able to meet the needs of neurodiversities, and to address the service to everyone.

#### Keywords

#participatory design, #technology, #autism, #TEACCH

# 2.

## Child-Centered Design approach guides to the creation of effective solutions for children with children

A research about Child-Centered Design Methodology has been developed in 2020 by Save The Children (Finland). They did an interesting experimentation of the methodology proposed that provides developers of services or organizations with an operating model and an array of tips and tools. It isn't a comprehensive service design guide, but it could be used to **work together with children to develop services that meet their needs**.

The approach is based on the combination of service design, children's rights and a child-centered approach together with the contributing factor of the perspective of **positive recognition**. The process and design tools are based on service design double diamond principle and thanks to the child-centered approach, we see the child as a valuable actor in the development process of solutions that are designed with them and for them.

### Why is it interesting?

The recent research shows how Participatory Design could be an approach that makes a very positive impact in children's activities. Participation and positive recognition give to the kids value and dignity into the activities and asking for what they think and how they feel, is a way to decrease their stress and frustrations. Furthermore, the Service Design process through all its phases, permits to iterate, implement, develop and refine the solutions whenever they need. Inclusive methodologies permit to address the needs of all the children, enabling positive exchange of ideas and adding value to diversity instead of subtracting it.

### Keywords

#participatorydesign, #child-centereddesign, #iteration, #positiverecognition, #children'srights

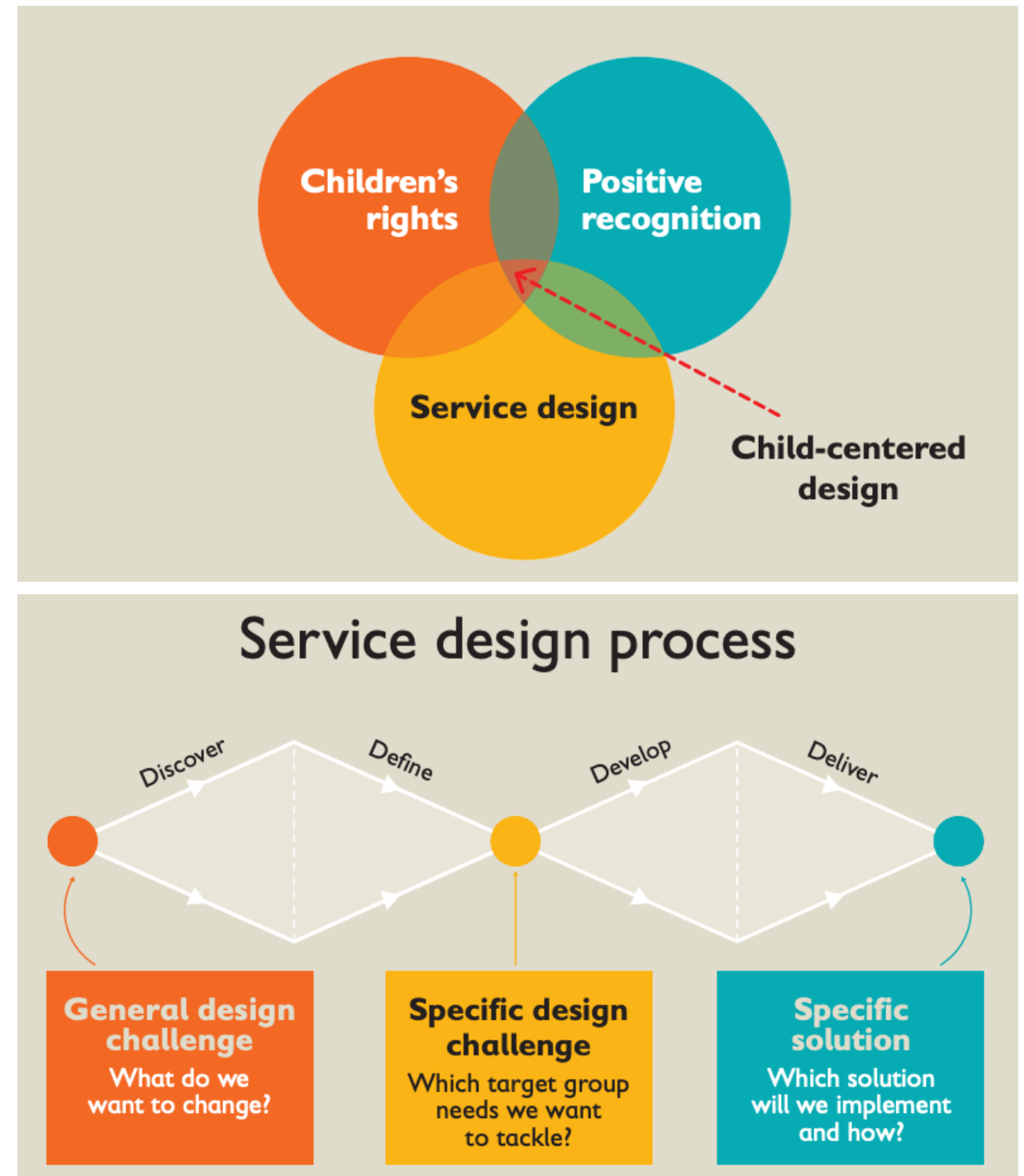


fig.(N)



### 3.

#### Agile methodology supports children in daily life improving their focus and their attention skills

thinkagile.com (\*) has developed different courses to introduce agile practices in the organizations.

Using agile methodology with 4 years old kids, helps them visualizing the work they have to do and the deadlines, and improve their focus and attention skills.

The first step is to make the work visible thanks to the Kanban board, a system that many organizations adopt to manage the flow of work. It's enough to have a white paperboard with some columns in which they can visualize the work **to do**, **doing** and **done** thanks to sticky notes (for young kids it could be nice to use **pictures or drawings instead of words**).

There's no right or wrong, it is just a visualization method that could support children with planning and organization and provides awareness about what they have completed and what they have to do. The kids result to be more motivated to get the work done and the parents don't need to be involved every minute of the day, but just provide feedback, correction and guidance. Plus, they have full visibility of what is planned, what the kids are busy with, and what they have completed. They could very easily see if there is a problem that needs their intervention.

#### Why is it interesting?

Agile methodology uses interesting tools and techniques that help with focusing on tasks and with organization, that are two of the major stress factors of children with ADHD. Using some of these strategies simplified, can help kids in being more relaxed and less anxious about all the work that needs to be done. It also increases skills like breaking up large pieces of work into smaller chunks, experimenting with new ideas, and understand how to solve a problem, it empowers children, giving them autonomy in being able to manage the workload.

#### Keywords

#Agile, #KanbanBoard, #planning, #organizationskills

\* <https://thinkagile.co.za/agile-for-kids/>

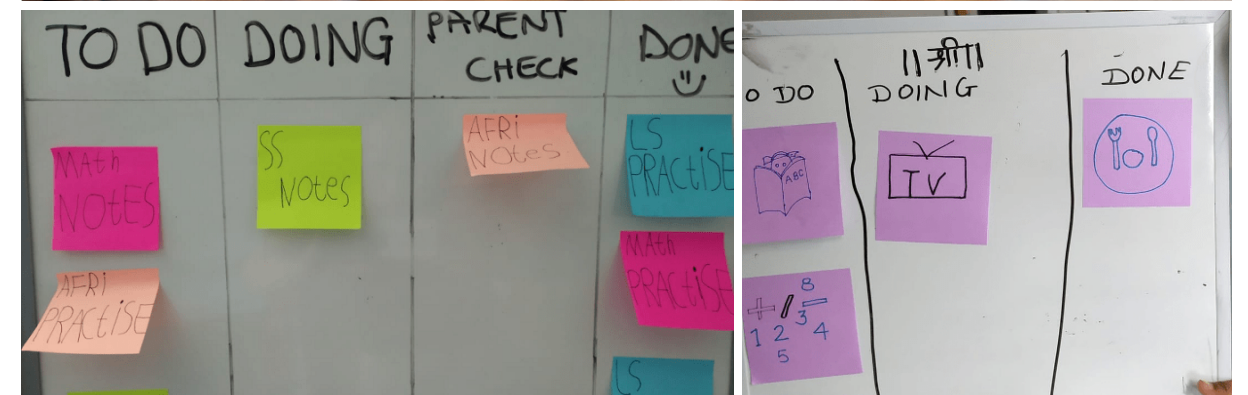


fig.(O);(P);(Q)

### 5.3 FORMULATING THE FRAMEWORK

Imagine that you are in a classroom of the first year of primary school. There's the Leo who is struggling in focusing on lectures, there is Lara who is thinking about her dolls at home, there's Andy the sensitive kid who needs to constantly ask when it comes the time to go home because he misses his parents, there's Manuel the hyperactive kid who needs to move around every ten minutes because he would just like to play football, and all the others... Imagine that while Manuel is thinking about football, starts suddenly moving his pencil around. His desk's neighbor notices that he's being distracted and decides to follow his pencil in the drawing of a beautiful sheep. Lara that is behind them starts asking what they are doing, Lucio close to her laughs, and this is how the class starts losing focus second by second...

This is a typical situation that a teacher has to deal with everyday in a classroom of primary school. They have a variegated group of 25, 28...30! selfish creatures. Some of them are calm and quiet. Some others are distracted, or inattentive. Some are hyperactive. Each one has his personal story, frustrations, needs and passions. Each one of them is constantly asking for attention, comfort and safeness.

#### The second "How might we..?"

Let's take in consideration 3 fundamental pillars that were presented in the reaserch:

1. **Participatory Design and Co-Design** with children that helps to build services for them;

2. **Addressing the needs of children** with learning and cognitive disabilities (**neurodiversities**) that permits to amortize their stress;
3. Inclusive design addressing the needs of children with learning and cognitive disabilities that contributes to the **benefit of all the others**.

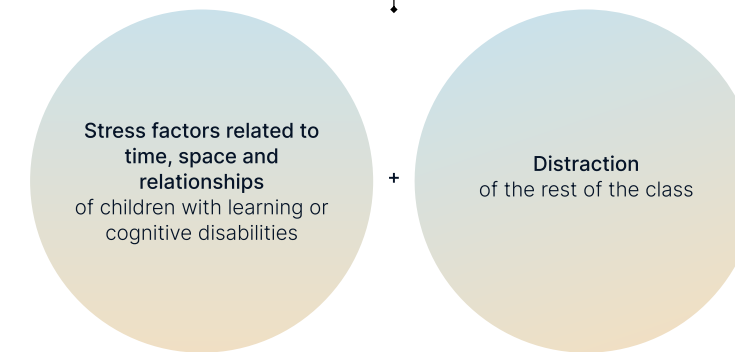
We can notice that all of these methodologies about how to address problems regarding kids and neurodiversities, put the individual and his needs at the center. Starting from the evidence, and from the insights that came up from the research regarding the importance of providing a safe and trustful context in order to decrease the children's level of stress (pp.36-37) we could be able to formulate a framework (fig.9) that could be tested and demonstrate how could be able to facilitate a lot the achievement of the goal, and will always take in consideration children's needs and perspective.

Here it comes the second HMW question: *How might we address the needs of those who struggle in focusing and time perception, in order to build a service that could benefit all the classroom?* The objective of the reaserch, is to concretize the answer of the question in a complete service that could address the frustrations of the children with:

- Space dimension
- Time Dimension
- Relationship dimension

but that will be used and experienced by the entire classroom and **will benefit everyone**.

#### 1. PROBLEMS



#### 2. HMW

How might we help teachers of primary school creating a more inclusive and comfortable classroom-system exploring the dimensions of space, time and relationships?

#### 3. OPPORTUNITIES



#### 4. FRAMEWORK

#### CONCEPT

How might we address the needs of those who struggle in focusing and time perception, in order to build a service that could benefit all the classroom?

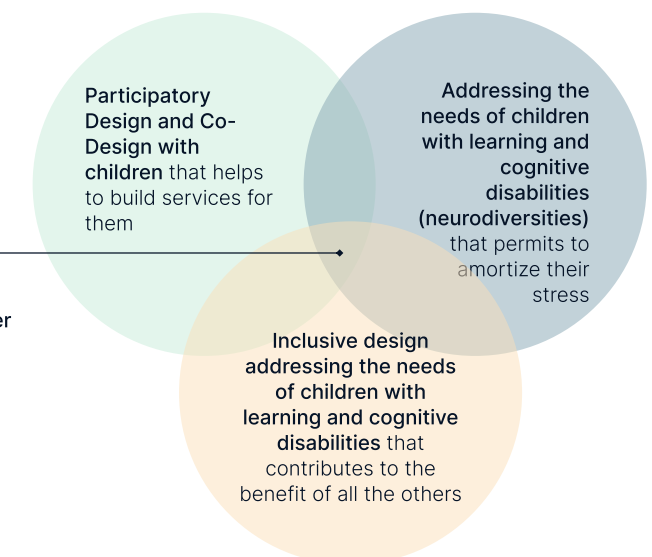


fig.9 Formulating the framework

# How might we help teachers?

## 6. DTOOLKIT: DO IT TOGETHER

### 6.1 THE CONCEPT

Dtoolkit (Do it together) is a service for teachers of primary school that aims to support them in the creation of an inclusive classroom. It will include special contents, materials and tools that will support them in managing a class with different neurotypes of children. The activities present in the kit, that have been created targeting the needs of those who learn and think in a different way, will benefit all the classroom system, supporting teachers in the creation of a comfort and enabling space for everyone. The service is based on the principles of Design for neurodiversities and on Child-Centered Design guidelines.

#### The objective

Dtoolkit objective is not to solve all the frustrations of the kids, but to become a concrete support for teachers, that will provide them tested methodologies and tools to personalize and to integrate in the lectures, in order to facilitate daily life at school. It is a service that will be able to help teachers in managing a classroom with different neurotypes of children, offering multiple solutions to create a comfortable space and to establish healthy relationships based on trust.

#### Pilot Dtoolkit: the testing

The pilot Dtoolkit has been tested (p.137) together with a teacher and her class of primary school (1<sup>o</sup> year). A tool of the section **Tools & Activities** (the core of the service) has been co-designed with the teacher meeting the needs and frustrations of children with ADHD, and tested on the entire classroom. Then it was implemented and co-designed during another session with the children.

The objective of the testing is to demonstrate that **targeting the needs of children with ADHD**, can effectively **benefit a broader system of children** and improve the entire classroom ecosystem.

# Dtoolkit

DO IT TOGETHER

## 6.2 VISION & MISSION

### Vision

Dtoolkit aims to be a point of reference for all the teachers of primary school.

It aims to help them to increase comfort, inclusivity, healthiness and safety in the classroom context.

Dtoolkit follows the guidelines of Child-Centered approach in order to address children's needs and to respect their rights. We want to give to all the children, but especially to those with learning or behavior diseases the tools to reduce their

frustrations about timing and organization.

We want all the children to move safely into the classroom space, and to reduce stressful situations.

We want all the children to be able to build safe and healthy relationships with teachers and peers.

We respect and see diversities as a strength and not as a weakness.



### **Mission**

Dtoolkit is for children, Dtoolkit is for teachers, Dtoolkit is for the classroom-system.

Our mission is to concretely support the primary school teachers with tools that will allow them to make the classroom space more comfortable and inclusive, supporting diversities, listening to the needs of each child, asking for participation and encouraging dialogue.

The key resource of Dtoolkit is a strong network of experts who will collaborate to create the contents, to select the best practices, the tips, the materials and activities (based on the needs of those who experience difficulties) that teachers could use with the goal of building effective ways together with children to reduce or learn how to deal with stressful situations.



## 7. THE SERVICE

### 7.1 DIGITAL TOUCHPOINTS

Within the following chapter the complete service scenario will be explained in detail: the offer, the eco-system map, the stakeholders' relationships, the customer journey, the business model, the mockups and the branding.

Every element will be described, in order to explain every element of the project and to have a clear visualization of which would be the opportunity to develop a solution in this direction.

Dtoolkit is a digital platform, that has two specific touchpoints: the website and the app.

These two portals are structured in this way:

- **Website:** it contains all the contents created by the DTeam (p.88). This digital touchpoint allows the teachers to look at the contents from a comfortable perspective, sit in front of her desk, and gives them the possibility to print the material easily. It's public, this means that everyone can access the website except for the interactive contents that are part of the reserved area.
- **App (Dtoolkit on the go!):** it contains all the contents of the website plus the interactive sections (the diary and the chatbot) that the teachers can easily access everyday and check during their daily life. It's exclusive for teachers.

These two platforms host the contents created and experimented by a strong network of expert, and have an impact on the classroom space, on the organization and on the relational dimension between teachers and children.



## 7.2 THE OFFER

The entire Dtoolkit can be divided in 2 fundamental parts: the contents and the interactive part (fig.10).







### Contents

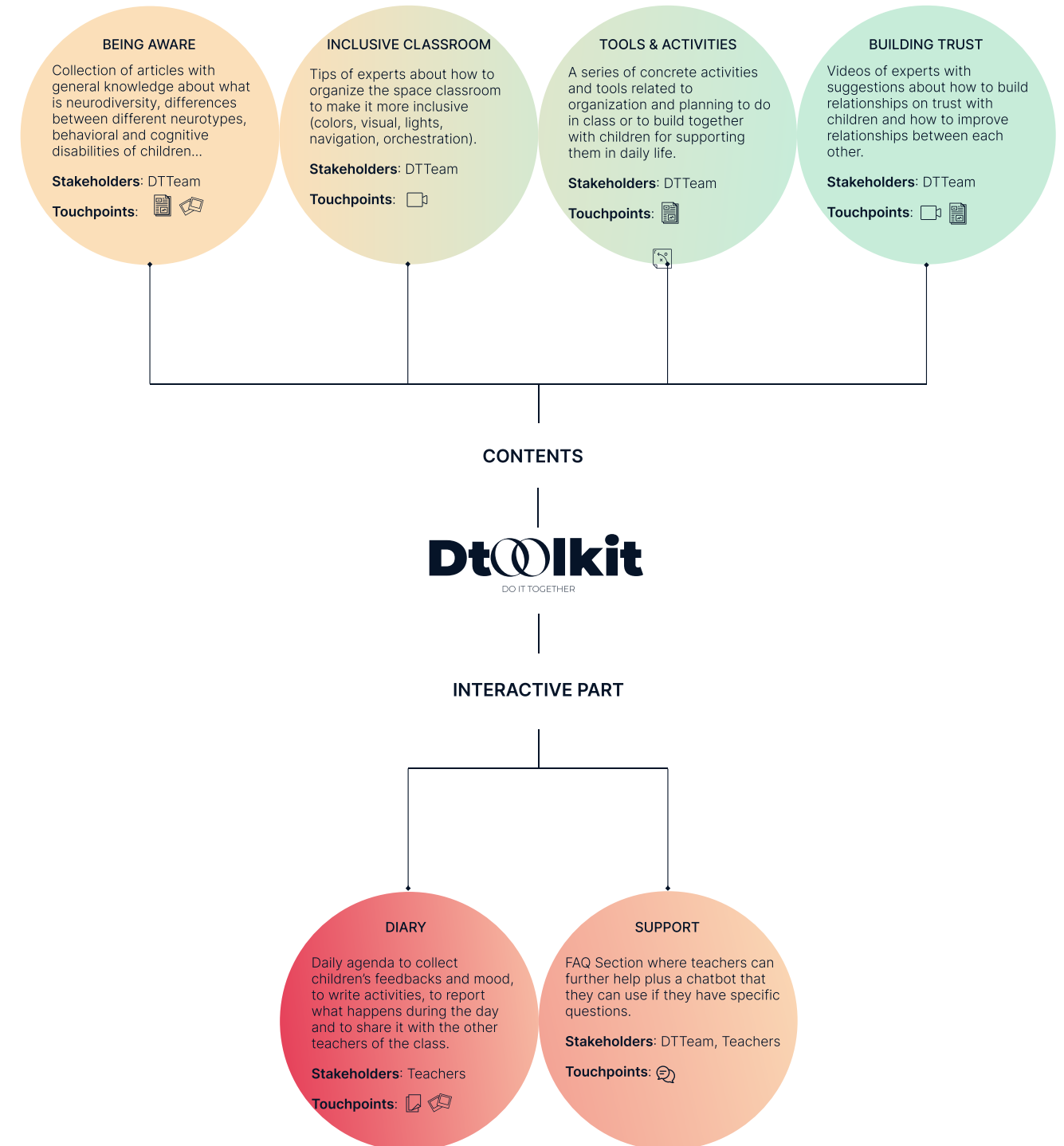
The contents represent the core of Dtoolkit. They have been created by the DTeam (Dtoolkit team), all experts in Child-Centered Design, and Design for neurodiversities. These guidelines are the primary source of knowledge and awareness about how to be an inclusive teacher and how to deal with neurodiversities in the classroom.

Contents section is composed by four parts:

- **Being aware - guidelines.** It is a collection of lectures and articles with general knowledge about what neurodiversity is, the differences between neurotypes, the behavioral and cognitive disabilities of children and other topics of interest about children at school.
- **Tools & Activities - time dimension.** It is a collection of tools and activities with the goal to support children in organization and planning (Kanban boards, timetables, calendars, visual cards..). Teachers have access to materials to print and to use in class or to concrete guidelines about how to build some tools together with children.
- **Inclusive classroom - space dimension.** It contains a series of short videos with tips about how to organize the classroom space (colors, visual, lights, navigation, orchestration), in order to increase accessibility, to facilitate navigation and to reduce stress and frustration.
- **Building trust - relationships dimension.** It is a set of videos made by experts with suggestions about how to build relationships on trust with children and how to improve relationships between each other.

fig.10 Offering map

TOUCHPOINTS LEGEND			
	Written Guide		Blank Space
	Maps ready to print and use		Explanation images
	Videos (tips or tutorials)		Chat





### Interactive part

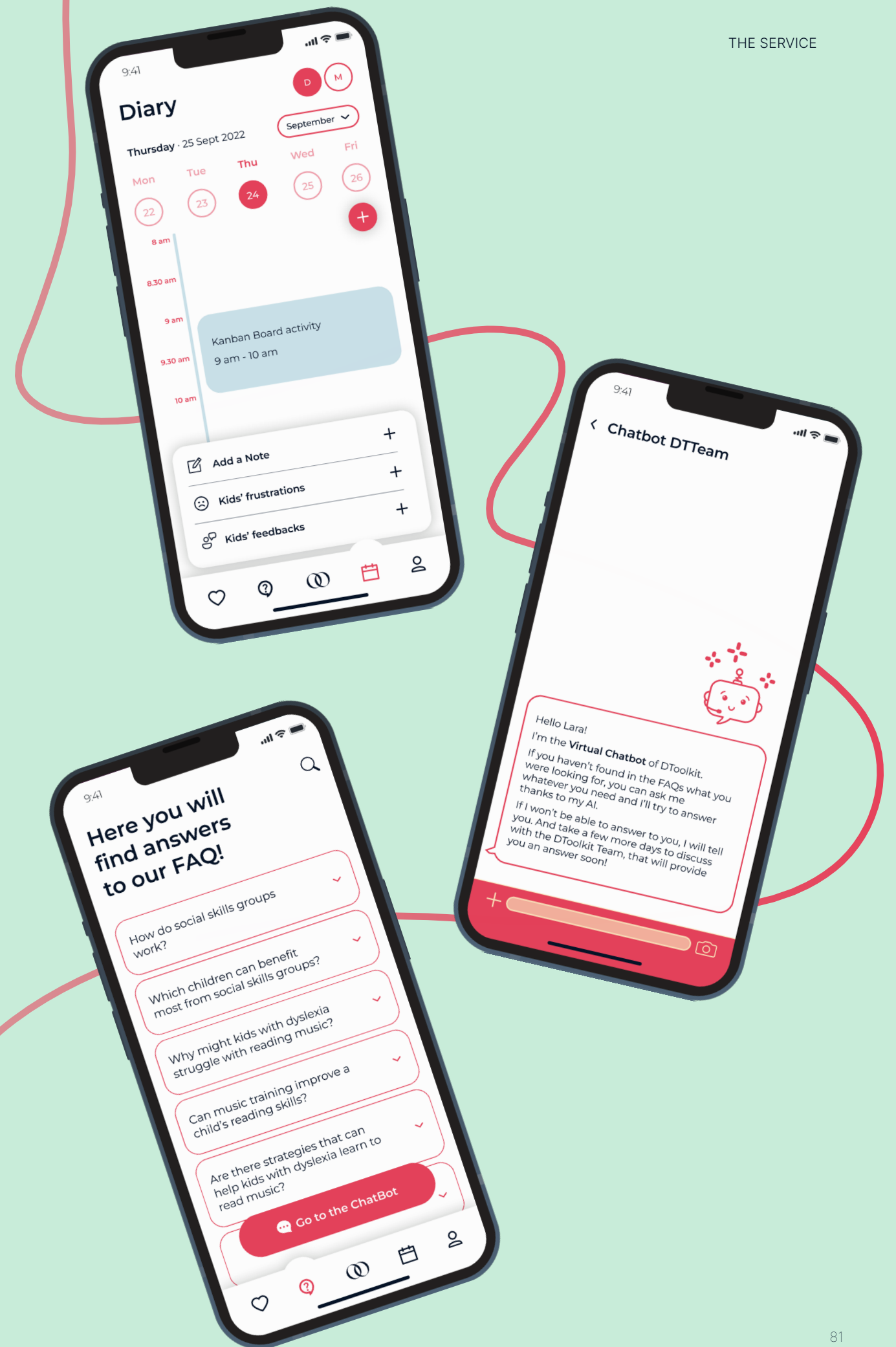
Thanks to this part of the service, the teacher has the possibility to track the classroom's daily activities and the children's moods and frustrations, and to share these informations with the other teachers of the class. Teacher can also quickly ask for further questions and support if it's needed. This part it's composed by:

- **The Diary.** It's an agenda for the teacher to track the classroom daily activity, the experience with particular methodologies and tools experimented and to collect children's moods and frustrations. It is shared between teachers of the same class, facilitating a lot the exchange of information between teachers.
- **A FAQ and intelligent Chatbot.** If they need for specific help, there's the possibility for teachers to consult a list of FAQ or to ask for support to an intelligent Chatbot. If the AI won't be able to find an answer, the question will be sent to the DTeam which will provide an answer in a brief time, then the new Q&A will be added then on the FAQs.

### The free and reserved contents

There will be two tipologies of contents in the portals. The free contents will be accessible by everyone, even from external stakeholders, and the reserved contents will be exclusive for those teachers who will be provided of the service by their school and will create an account.

- **Free contents** (€0/year): website dashboard, 10 articles from the Being-Aware guidelines in the website;
- **Reserved contents** (€250/year, paid from the school): all the articles of the section Being-Aware in the website, the section Tools & Activities in the website, the section Inclusive classroom in the website, the section Building trust in the website, the App *Dtoolkit on the go!*



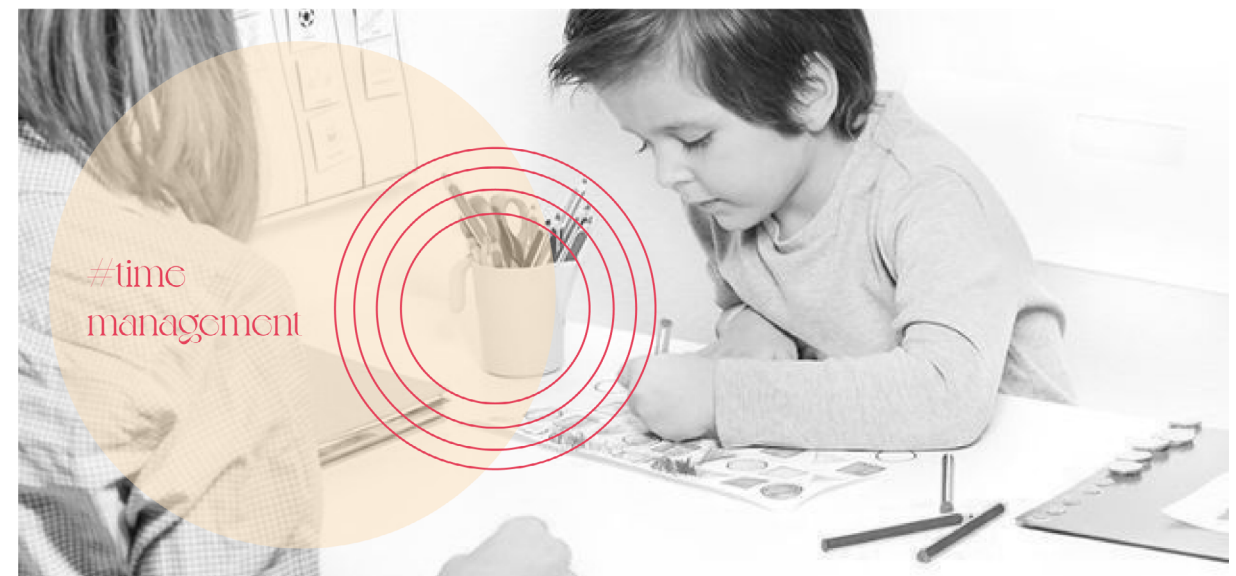


### 7.3 THE TARGET

Dtoolkit has been built on the needs of teachers of public primary schools that lack of guidelines and support about how to create an inclusive classroom context and a comfort space for children with the minimum cost and an effective result.

The objective of Dtoolkit is to support teachers in targeting and satisfying the needs of children who experience learning or behavioral diseases in a more inclusive way, respecting the differences and the strengths of each of them and creating a comfort and safe situation for everyone. Dtoolkit is important for teachers because it is a support that helps them in managing different neurotypes of children in the same space and while doing the same activities.

Thanks to innovative activities, tools and guidelines, it aims to rethink the way of teaching in an interesting way, making it more flexible and inclusive. Dtoolkit is for teachers, but it is also for every children.



## 7.4 CORE PRINCIPLES

Dtoolkit is based on three core principles:

### Participatory Design and Co-Design with kids

Child-centered approach sees the child as an active protagonist of every phase of the experience, and this is crucial because when we design services for children we must take in considerations the insights gained from them as valuable as any views provided by adults. Ensuring that children are seen as individuals and that the process seeks to meet their thoughts and needs, is DTeams' and their teachers' responsibility. In fact, adults have the possibility to empathize with children by stepping into their shoes, plus constantly asking for their opinion and participation throughout all the phases and to build effective experiences for them.

The DTeam has created all the contents, the activities, the guidelines and the tools with the intention to meet needs and abilities of every child, giving them the same opportunity to participate in all the parts of the service and including their opinions and feedback. In this way, every member of the DTeam and every teacher who will use the service in class will follow the principles of Child-Centered approach and will consciously pay attention to the children's various weaknesses, strengths and successes.

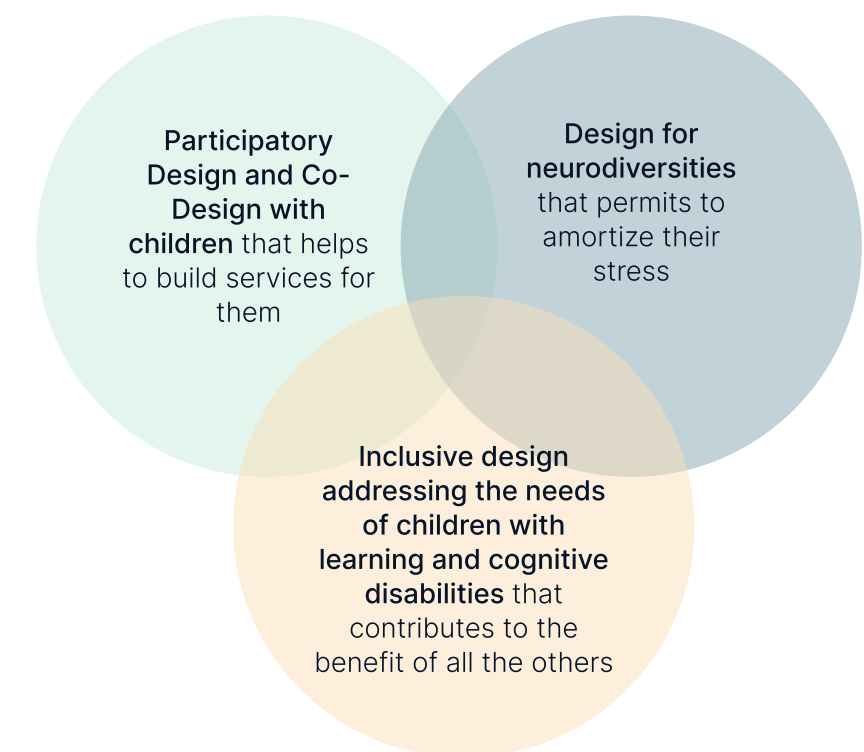
### Inclusive Design

Every child learns in a different way because there are many factors affecting achievement, including ability, personal skills, problems or diseases, emotional state, age and maturity. Every child is unique and has particular talents and resources that should be strengthened and should become starting points for growth and development. Dtoolkit aims to support teachers in helping children to grow, to discover their abilities and to learn how to reduce and control their frustrations. The core of the service is helping teachers in giving to all the kids the opportunity to reach their maximum potential and to experience success in learning. Thanks to the different tools, techniques and methodologies, the needs of every child, included those who experience difficulties, will be identified and satisfied. Dtoolkit's goal is to promote an environment able to respect individuals diversities and differences and to support teachers in providing an enabling classroom context.

### Design for Neurodiversities

It's harder to keep the focus high, sometimes even to think for neurodiversities. They experience many more challenges than typical people, because some of their senses are amplified. We know that how we design spaces have a profound impact on the people who live them. In fact, if we provide a comfortable and accomodating environment, it would be possible to mitigate distractions and to decrease stress of those who think and learn differently, increasing instead their productivity.

The experts of the Dteam who will create the contents related to the space dimension, will provide suggestions about how to reduce the issues making the environment more comfortable and safe to the senses. They will take care of visual noise, audio, sensory stimulations, wayfinding, orchestration of elements, and make the context more enabling for everyone. They will create a supportive space for health and wellbeing, where a wide variety of children could successfully express themselves and complete their work.



### 7.5 RELATIONSHIPS MAP

One of Dtoolkit's goals is taking care of different emotional aspects of daily life at school both of the teachers and of the children. The core objective connected with relational dimension is learning how to build safe and trustful bonds, since as we have demonstrated in the research, it is one of the best ways to reduce stress and frustrations and to increase relax and happiness. All the elements the service seek to take care of three typologies of relationships (fig.11).

#### Relationship Children - Teacher

The bond created between a child and his/her teacher is fundamental for two reasons: kid's emotional wellbeing and their performance at school. In fact, teachers able to build relationships with children based on empathy, trust and information, will reduce a lot their frustrations and will improve their mental condition. Dtoolkit wants to provide knowledge and concrete activities that should strenghten this relationship, respecting each child's uniqueness, understanding their specific needs, listening to their feedback and asking for their participation in the classroom activities.

#### Relationship Children - Children

Through relationships, children learn about their world understanding how to think, communicate, behave and show emotions. Teaching gentleness and warm responding, we communicate safeness and acceptance to the children, helping them to learn how to act with their companions and with other people who surround them. Relationships between children are important because give to them the confidence to explore, observe, move and sometimes make mistakes. This is the reason why Dtoolkit section related to trust building, contains videos about how to encourage and support relational bonds between children, even the ones that look weaker or harder to develop. Teachers can learn to understand which relationships work and which, instead, need to be supported and grow under their supervision in a safe context.

#### Relationship Teacher - Teacher

We know how much important could be for teachers having a fast but effective way to share comments about daily activities, specific episodes, children's moods and frustrations or problems related to the class. «We usually leave a post-it on the desk to the teacher that will come after, with all the important notes of the day...» (Cristina Beretta). Dtoolkit provides the opportunity to enhance communication between teachers, creating a concrete touchpoint (the diary) and

giving parameters to track the experience of the class and the children during the entire course of the year.

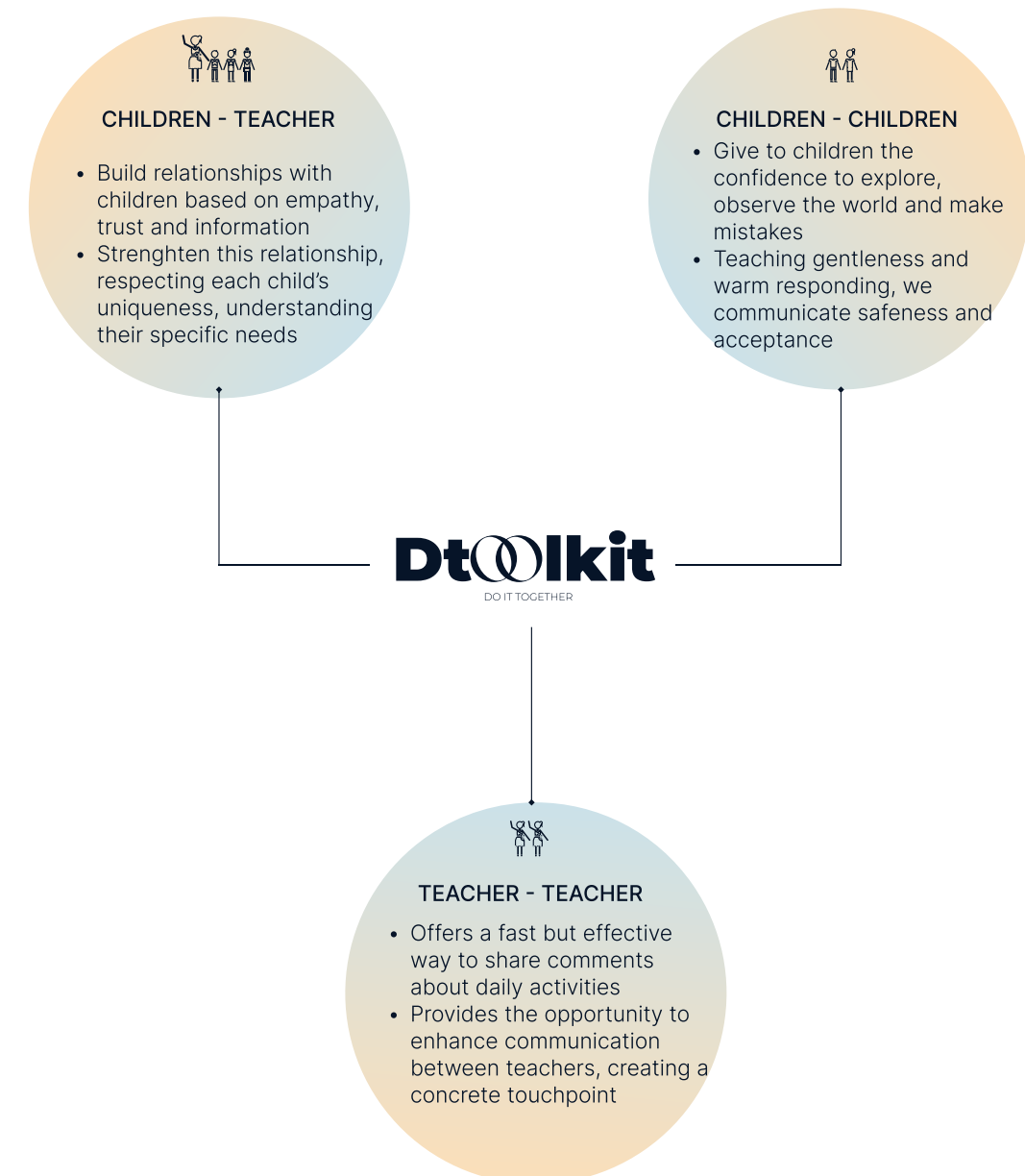


fig.11 Relationships map



## 7.6 ECOSYSTEM MAP & STAKEHOLDERS

The Ecosystem Map (*fig. 12 Ecosystem map*) describes the relationships of the different stakeholders who are involved in the service, from the ones who strictly collaborate in the contents' creation (Deep Interaction), to who represent the target of the service, to the ones who have a secondary but fundamental role, as the schools who decide to adopt the platform.

The arrows represent the typology of relationship that connects one element to the other:

- **Interaction through Dt:** it means that people connected with this arrow have a direct contact with DToolkit because they use it or because they are concretely part of the target.
- **Information exchange:** it means that people connected with this arrow provide or receive an exchange of knowledge.
- **Money Exchange:** it means that people connected with this arrow receive or provide money to finance the project.

The service is addressed to teachers and consequently to the children of primary school (in this case we consider public school), however there are other groups of people who collaborate in the platform creation and realization.

I divided the groups in categories.

### School entities and financial source

- **Public schools** have the responsibility to decide if adopting the app (*DToolkit on the go*) or not. They receive from Ministry of education the funds that they could spend for projects related to inclusivity or support for learning disabilities. If the school decides to adopt the service, they have to pay an annual subscription of 250€.
- **Ministry of education** enact every year the decision to finance projects related to inclusivity or support for learning disabilities. Thanks to the MIUR funds, it will be possible for public schools to pay the service for all the teachers and to contribute to the platforms' revenues.
- **Private schools** have the responsibility to decide if adopting the app (*DToolkit on the go*) or not. If the school decides to adopt the service, they have to pay an annual subscription of 250€.

### DTeam

The stakeholders in the DTeam have to collaborate together for the creation of all the contents. After the platform's launch, they give a contribute in answering the questions of chatbot (the ones that

cannot be answered through AI).

- **Teacher/s** have experience in child-centered approach and innovative methodologies that aim to address neurodiversities' needs and frustrations. They collaborate with the other experts to write the contents and to create the tools and the activities.
- **Psychomotor carer/s** are expert in the body expression and in the ability to understand body's signals and how to control behaviors and impulses. For kids, knowing these aspects is fundamental and it's necessary for the creation of a comfort space, for this reason this stakeholder takes part to the contents' creation.
- **Psychologist/s** actively participate in the contents creation, especially in the section "Building trust". They are in charge to create the contents for a series of video about how to establish with kids healthy relationships based on trust. Their supervision and suggestions is crucial for managing specific situations or problems related to the emotional and relational sphere.
- **Speech Therapist/s** are expert in the connection between mind, thoughts and language and know very well the problems and frustrations related to the behavioral and learning dimensions. For this reason they contribute to the contents creation.
- **Interior Designer/s** take part in the realization of the video tips with the correct set of guidelines to create a classroom space that is comfortable for all the senses in the cheapest and most simple way.
- **UX/UI Designers and Developers** are the employees who design and develop the platforms and do the maintenance.

### Target

- **Teachers of primary school** are those whom the service is addressed to. They interact with the website and with the app (*DToolkit on the go*) and use the contents and the activities together with children in class.
- **Children of primary school** are the indirect target, because even if they don't directly interact with the platform, they experience the tools and activities that the teachers propose to them, or the approach that they adopt with them.

### Other stakeholders

- **Parents** don't directly interact with DToolkit but they are informed by teachers about the tools that kids use at school. They can decide to give continuity to the kids at home and to consult the website themselves.



**LEGEND**

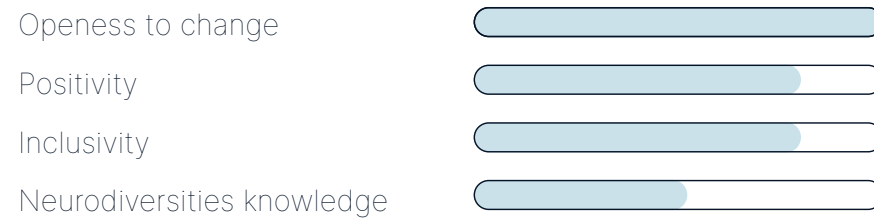
- Financial source
- School entities
- DTeam
- Target
- Other stakeholders

- ↔ Interaction throug DT
- ↔ Information Exchange
- ↔ Money Exchange

\*with experience in child-centered approach and inclusive design

“ I would like to become a point of reference for my kids. I want them to come to me everytime they have a problem or experience frustrations. ”

Lara  
28 y.o.  
teacher



**7.7 PERSONAS: LARA, THE YOUNG TEACHER**

**Description**

Lara, a young but talented teacher, will teach in a class of the third year of primary school San Salvatore for the first time in September. She is sweet and gentle, and usually beloved by her kids. One of her strengths is that she is always open to host interesting suggestions and methodologies to improve her job. This year she will face a particular situation in class: she will have some students with ADHD, some with difficult situations at home (parents divorcing, a parent lost his job...) and other cases of behavioral disease. Sometimes it's hard to have different situations to manage in the same classroom, and she doesn't like to exclude kids or to punish the ones who could be a distraction for the others. She would like to encourage inclusivity and to teach to her kids that being diverse is a point of strenght, not a weakness. She is very good in interpersonal relationships, however she is struggling in managing so many neurodiversities at the same time and in the same place, and for this reason she thinks she might need a help.

**Needs**

- Concrete support. She needs to learn innovative methodologies to adopt or guidelines to follow for the classroom management.
- A quick way to share with her colleague everything happens in the class everyday, especially the children's moods
- To teach to her children that being diverse is a strenght, not a weakness.
- To teach to her children how to learn

**Frustrations**

- It's hard for Lara to manage hyperactive children and the others at the same time.
- Sometimes children stop listening to her, during the lectures and she doesn't know how to regain their attention.
- She doesn't like frontal lectures, she prefers to stay with the kids in circle but doesn't know which is the best way to dispose forniture, desks and visual elements in the class.



BEFORE THE BEGINNING OF THE SCHOOL

DURING SCHOOL

steps

description

touchpoints

emotional curve

steps	Introduction	Exploring the platform	Preparing the space	Discovering the diary	Observation	Introducing a new activity	Preparation of the material	Building a Kanban board
description	Before the beginning of school, the head teacher introduces Dtoolkit to the teachers providing the access to the website and asking them to download the app.	Lara is curious. She decides to start studying the majority of the contents before interacting with kids, to be more prepared. She looks into some videos, tips, and guidelines that she finds in the app.	One of the first things that she does before the arrival of the kids in class is changing the space disposal in order to make it comfortable for different neurotypes. She disposes the desks in a U, uses pastel colors for posters and takes care of the clear navigation within the space.	Lara follows the tips she read in the very first sections of the platform: she starts observing her class, understanding the situation, speaking with kids and listening to them. She also takes notes of some particular situations. She uses the diary on DToolkit on the go to share everything with the colleague.	Lara notices that sometimes it isn't easy to finish the lectures because there are many different reactions: a lot of kids gets distracted, some of them are hyperactive, some others aren't able to focus on tasks and homeworks, and some others are just distracted by the companions...	Lara decides to propose an activity to her kids, that would help them with planning and organization and to have a clearer idea of the timetable and the subjects. This should help them to have more time perception and to focus more. They will build together a tool that will help them with this.	Kids appreciated the idea. Lara prints the material for the planning board from DToolkit app and prepares the rest of the material by herself.	...Lara puts all the activities in the envelop and every morning moves together with children the activities of the day from the envelop to the "TO DO" column and then from the "DOING" to the "DONE" column. In this way, kids became more aware on the time slots.
touchpoints								Kanban Board

curious

interested

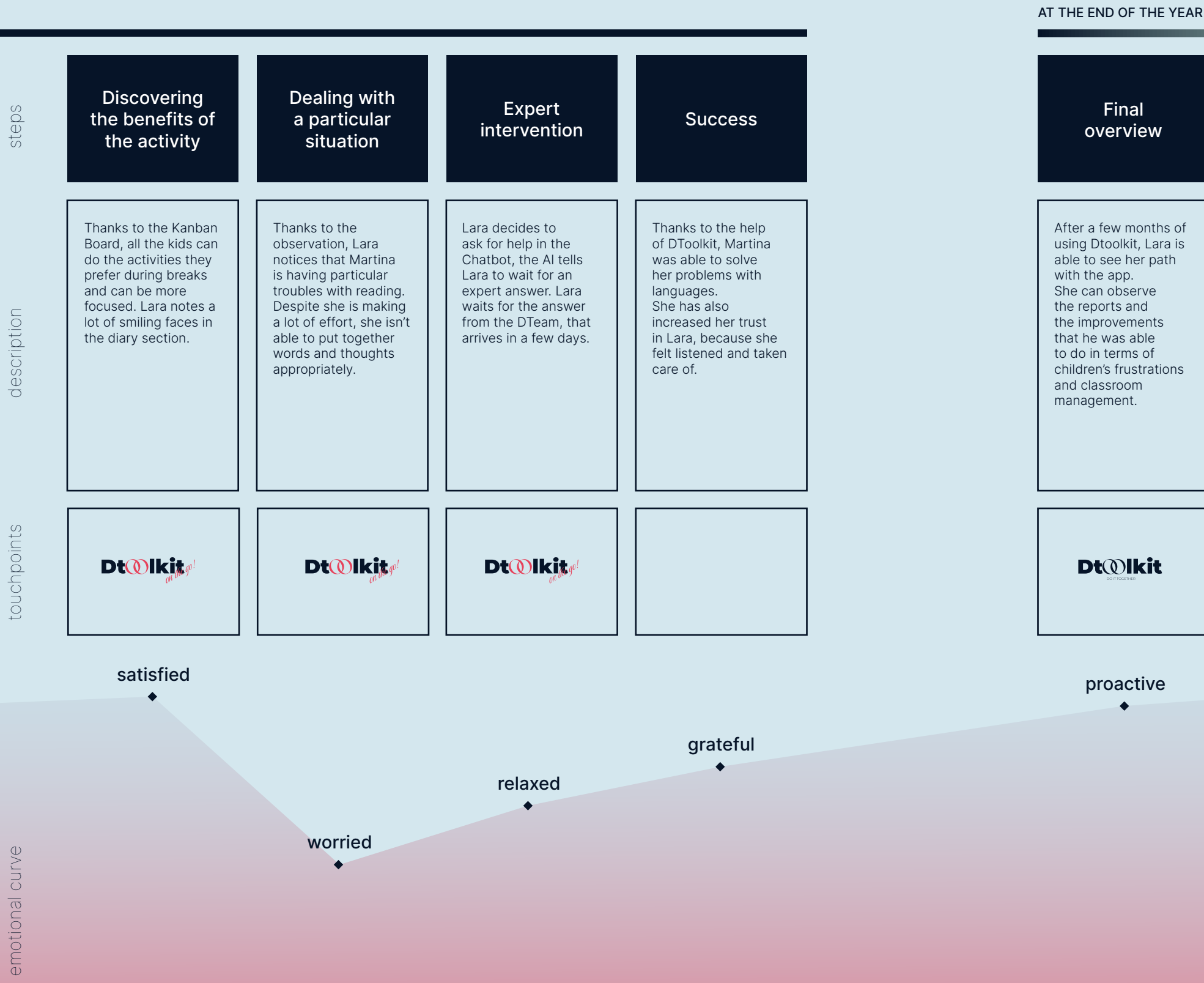
excited

focused and a bit worried

hopeful

surprised

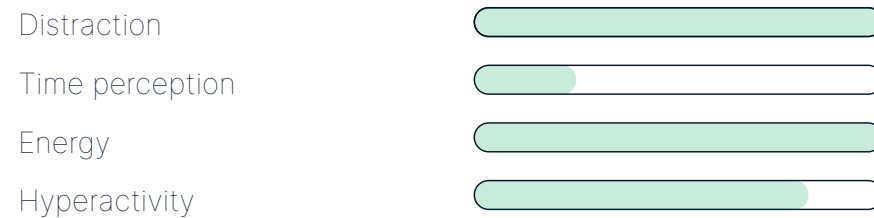
happy



“ Sometime I get stressed because I’m not able to listen to the teacher for more than 30 minutes: I get bored and I’m never able to conclude the tasks. I would prefer to play football and jump around all the time! ”

# Valerio

8 y.o.  
child



## 7.8 PERSONAS: VALERIO, THE HYPERACTIVE KID

### Description

Valerio is a sweet, full of energies, boy of 8 years old. His favourite hobbies are playing football everytime he can, and inventing every kind of weird game in order to avoid doing homeworks. He is a smart kid but at school, he often struggles in focusing and getting the tasks done because of his ADHD. In class, he gets distracted for everything: a mosquito flying, the posters on the walls, the butterflies outside the window... His last teacher used to be severe with him, forbidding football during ricreation and keeping him close to her desk. Valerio spent a very hard time: the more the teacher got angry without listening to his needs, the more he was unable to express his personality and became impulsive and aggressive with other children. For Valerio even to make friends has become very hard. He hopes that with the new teacher, Lara, something will change. However he doesn't trust her yet.

### Needs

- To be listened by the teacher and to have a space to communicate his needs.
- To move around in the space sometimes and to get fresh air.
- To trust the teacher and to feel continuity from school to home in order to remember what he has to do and to express his potential at best.

### Frustrations

- He struggles in looking for the focus because he doesn't know when the activity will finish and how long it will take.
- He always forgets books and material because of his distraction.
- He gets bored fast.

BEFORE THE BEGINNING OF THE SCHOOL      DURING SCHOOL      AT THE END OF THE YEAR

steps

description

teacher's touchpoints

**Remembering his past experience**

**The first day in class**

**Discovering the space**

**A welcome activity**

**A surprising beginning**

**The Kanban board**

**Customizing Dtoolkit**

**Using DToolkit activities**

**Symptoms improvement and stress decreased**

A few days before starting the second year of primary school, Valerio starts being anxious: he's afraid of the new teacher because he had a bad experience the first year. The teacher he had, used to treat him as different because of his ADHD and for this reason he didn't have many friends...

The first day of school, Valerio is alone, he walks sadly into the classroom with the idea to sit close to the teacher's desk as it was the past year.

As soon as he enters the class, he notices some changes: the colors are delicate, the lights are soft and the desks are disposed in a "U" shape. There isn't Valerio's desk close to the one of the teacher like the year before.

Immediately, teacher Lara, proposes a welcome activity: it is a game with cards with the objective to set desk neighbours. The scope was to be closer to people with similar hobbies this month, next month with the same favourite colors, the month after with same favourite sport and so on.

The first days at school were surprising. The soft colors and lights and the lack of visual distractions allowed Valerio to focus more and to be less stressed. However he still has problems with planning (time) and organization of the materials to bring at school.

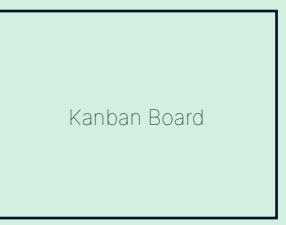
Thanks to the activity of the planning board, Valerio had a lot of fun! It will help him a lot with his frustrations with time references. He also appreciates the fact that he can choose the activity of the breaks together with his companions.

Valerio asks Lara if he can bring at school his favourite ball, to play during breaks. Lara was okay with this, but he made an agreement with Valerio: the promise is that he would use the ball just during breaks!

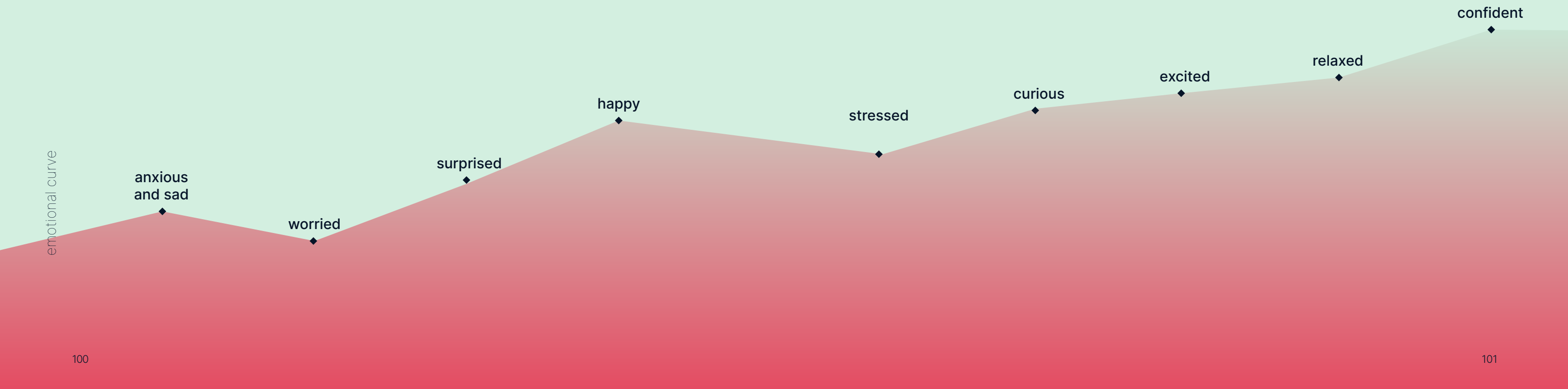
Lara creates with all the kids a backpack list to attach on the school backpack with the shape of a travel ID card. It contains all the material to put in the bag every day of the week, facilitating backpack preparation.

Thanks to DToolkit, Valerio has learnt:

- To be more confident in his potential and in his companions, too.
- That he is capable. He is able to focus on tasks and to complete them, he just didn't know how to do it before.



emotional curve



### 7.9 BUSINESS MODEL AND ECONOMIC PLAN

In order to concretize the project, I hypotized a business model (fig.13) and an economical plan (fig.14).

I would like to highlight that the section contains a high level aestimation and an aproximate calculation of the costs and revenues. In fact, the scope isn't to create an official version of the business plan with definitive computations, but to show the opportunities that Dtoolkit has in terms of concrete realization through evidence and realistic datas.

#### Business model canvas

The business model canvas is the plan that I used to describe how the service could develop in a market opportunity and could actually make money. I used the model as a tool to visualize the business elements necessary for the realization, and this was a crucial step in order to have a quick overview of the value proposition, the key partners, the key activities, the key resources, the customer relationship, the channels, the customer segments, the costs and the revenues.

#### Costs

The priority was to identify all the costs (ex. the expenses for the experts, for the maintenance, for the designers, for the platform, for the advertising...), that I divided into three categories: starting costs, fixed costs and variable costs. There are two possibilities to cover the starting costs: opening a startup and looking for business angels to finance the project or presenting the project to one of the MIUR's bans for initiatives that support scholar inclusion(\*).

#### Revenues

Then, I thought that in the scenario that I imagined the service should be free-offered to all the teachers of the school from the school itself, that should pay an annual fee to renovate the subscription to the platform. However, while for private schools it could be easier to bear the expense, for public schools it wouldn't be the same. For this reason, after a research with the scope to understand if there are some national funds to support public schools in inclusivity and learning or cognitive disabilities, I was able to identify the revenues.

"Decreto sostegni bis"(\*\*), is a monetary incentive to improve, implement or adopt digital services to support education or learning and cognitive disabilities at school, that has been issued from MIUR in february 2022 and released in August. From 20.000 € to 40.000 € (or more) have been assigned to more than 7000 italian schools that requested it, for a total of 350 million euros.

\*<https://infobandi.csvnet.it/miur-bando-per-iniziativa-a-supporto-inclusione-scolastica/>  
 \*\*<https://www.erickson.it/it/mondo-erickson/articoli/bandi-finanziamenti-scuola/pon-decreto-sostegni-bis/>

fig.13 Business model canvas





fig.14 Economical plan

INVESTMENTS COSTS		
Week needed	40	
Working hours	4 h/week	
EXPERTS (EXTERNAL COLLABORATORS)		
Experts salary	50 €/h	
Primary experts (2)	320 h	16.000€
Secondary experts (3)	240 h	12.000€
<b>Total cost</b>		<b>28.000€</b>
APP		
App developers salary	50 €/h	
UX/UI and graphic	100 h	
Development	480 h	
User Testing	80 h	
Project Management	120 h	
Market and adv	24 h	
Total # of hours	804 h	
<b>Total cost</b>		<b>40.200€</b>
<b>Website</b>		<b>4000€</b>
<b>Advertising</b>		<b>5000€</b>
<b>Extra costs</b>		<b>5000€</b>
<b>Costs</b>		<b>82.200€</b>

- Sources for the datas:
- <https://www.psy.it/nomenclatore;>
  - <http://www.pedias.it/file/Tariffario%20consigliato%20per%20i%20Pedagogisti%20della%20P.ED.I.A.S..pdf;>
  - <https://www.centrocomunicarelogopedia.it/wp-content/uploads/2021/02/tariffario-2021.pdf;>
  - [https://www.tooltester.com/it/blog/costo-sito-web/;](https://www.tooltester.com/it/blog/costo-sito-web/)
  - <https://www.nextre.it/quanto-costa-unapplicazione/#:~:text=In%20base%20alle%20ricerche%20effettuate,%E2%82%AC45.000%20a%20%E2%82%AC82.000>

REVENUES	
Total number of schools	7360
Market share	10%
Total customers	736
Subscription price/year	250€
<b>Total revenues</b>	<b>190.750€</b>

COSTS	
<b>Fixed costs</b>	
Advertising	5000€
Maintenance	800€
Employees	7200€
<b>Total fixed costs</b>	<b>13.000€</b>
<b>Variable costs</b>	
Experts for contents updating	38.150€*
<b>Total costs</b>	<b>51.150€</b>

\*Hipotizing that the 10% of the people who will use the service will ask 1 question during the year

PAYBACK				
Year	0*	1	2	3
Investment	82.200€			
Costs	12.788€	51.150€	51.150€	51.150€
Revenues	47.688€	190.750€	190.750€	190.750€
Profit	34.900€	139.600€	139.600€	139.600€
Taxes	17.450€	69.800€	69.800€	69.800€
Net Cash Flow	- 64.750€	69.800€	69.800€	69.800€
<b>NCF Somme Parziali</b>	<b>- 64.750€</b>	<b>5.050€</b>	<b>74.850€</b>	<b>144.650€</b>

\*"year 0" has 1/4 of the costs and revenues because the first 9 months will be dedicated to the project creation

**Net Cash flow (worst scenario)**

Given the amount of money assigned to each school (from 20.000 € to 40.000 €) I hypotized the worst scenario with a 3-year forecasting (fig.15) with the following characteristics:

- The potential market is just the 10% of the schools that received the money (763 schools);
- There isn't any growth of the market segment after the first year;
- We consider the revenues of the year 0 just 1/4 because the rest of the time should be dedicated to the contents creation (9 months);
- Each school that will adopt the service, will pay an annual subscription of 250 €.

If we consider that during **year 0**, 9 months will be dedicated to the project creation and launch, we will have an investment of 82.200 € plus 12.788 € of variable costs, then 47.688 € of revenues and 17.450 € of taxes, the Net Cash Flow will go lower than zero (- 64.750 €).

Despite the premises, Dtoolkit will re-enter the costs after the first complete year of revenues and will grow until the third year arriving to 144.650 € of Net Cash Flow, thanks just to the revenues of the 10% of the schools who received the money.

fig.15 Net Cash Flow



## 7.10 MOCKUP

### The Website platform

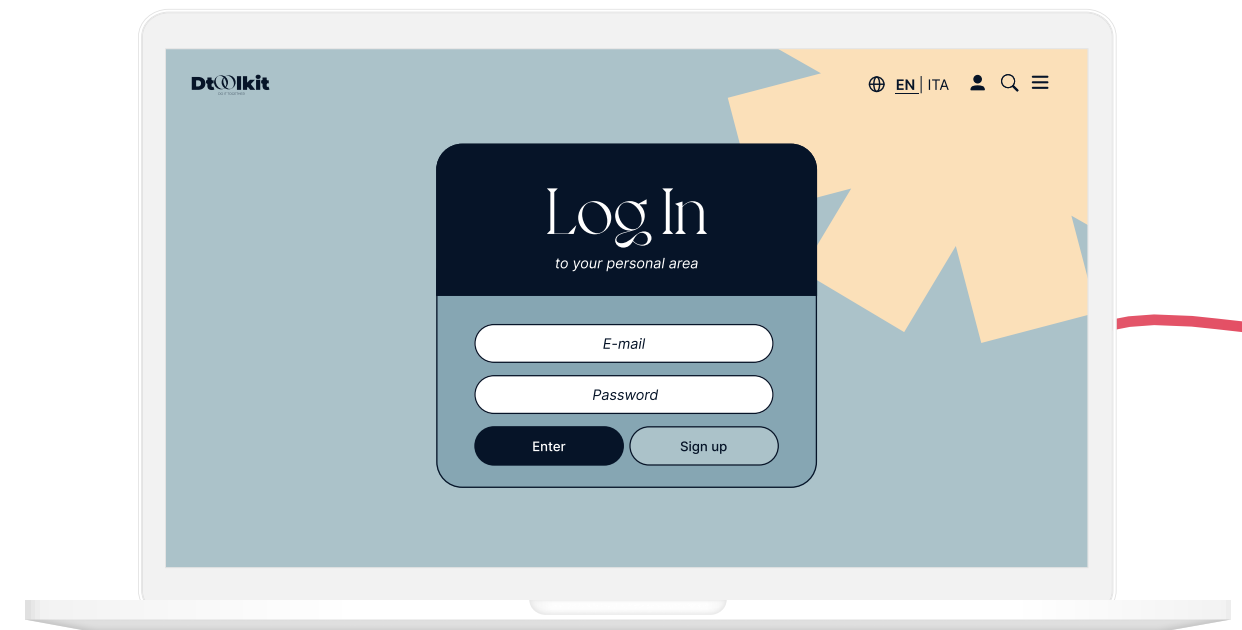
The website platform has been designed with the objective to become a tool that could be accessible by everyone. Part of the contents of the section **Being Aware** and **Tools & Activities** will be shown in the normal navigation, together with the dashboard, the explanation of what the service is, the mission, the **About us**, the names of the experts who contributed to the platform creation and the contacts. The rest of the contents will be accessible just from those teachers who will own an account, that means just the ones whose school has adopted the service. They will access their personal profile from the **Account** section, explore and navigate all the contents, watch the videos and easily print the material designed for them. Their profile will be customized based on their favourites and on their interests.





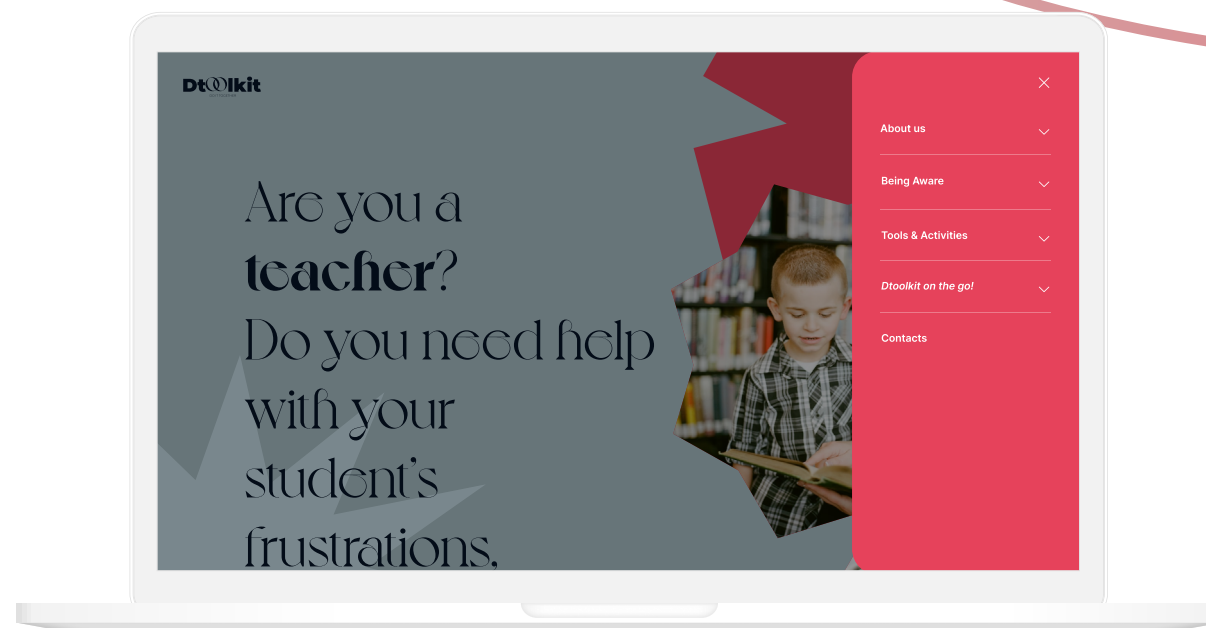
**Dashboard**

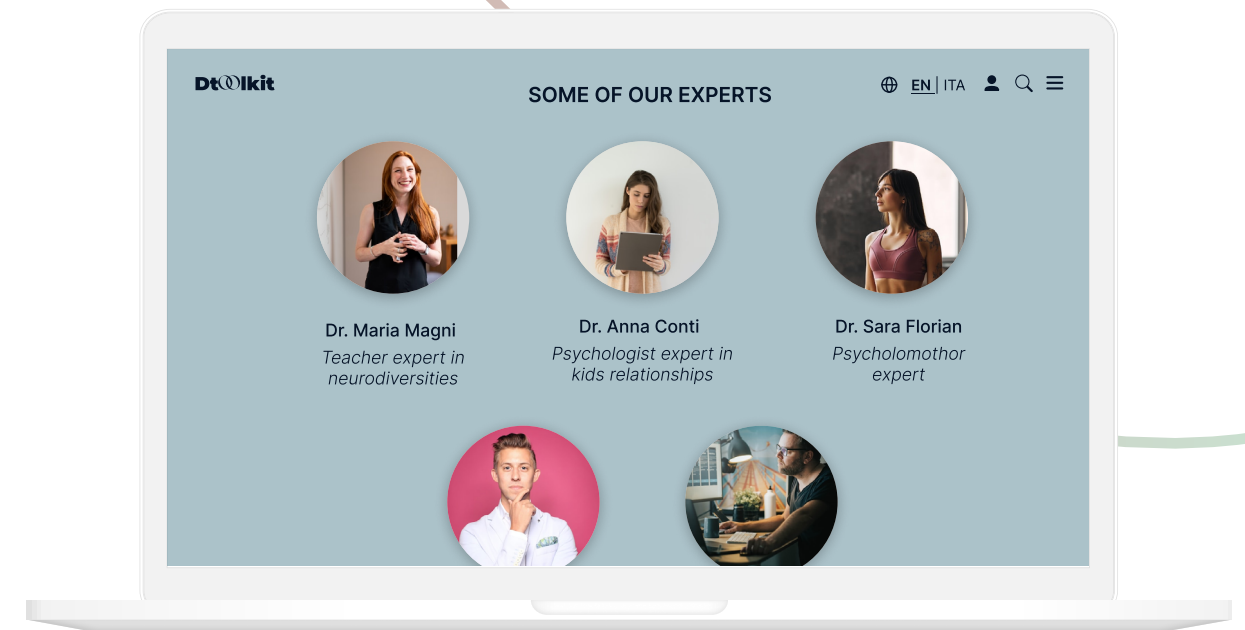
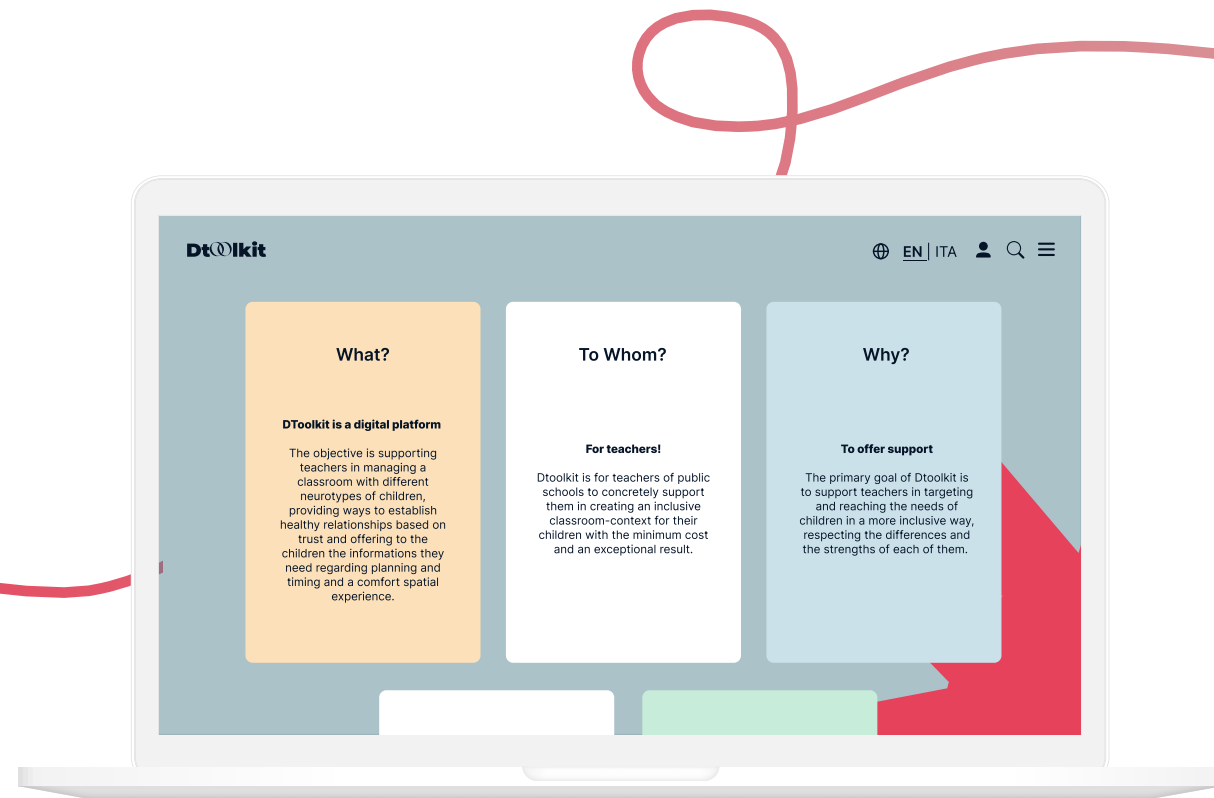
The user can navigate the dashboard page, where he can find a menu on the header and he can scroll down a vertical showcase of the most relevant elements of the service. Clicking on the hamburger icon on the top right, he can open the menu with the list of all the contents.



**Log In**

The teacher can access to his personal area through a Log In section. Here he can find the contents that Dtoolkit has reserved to him and a personalized dashboard, based on his preferences.

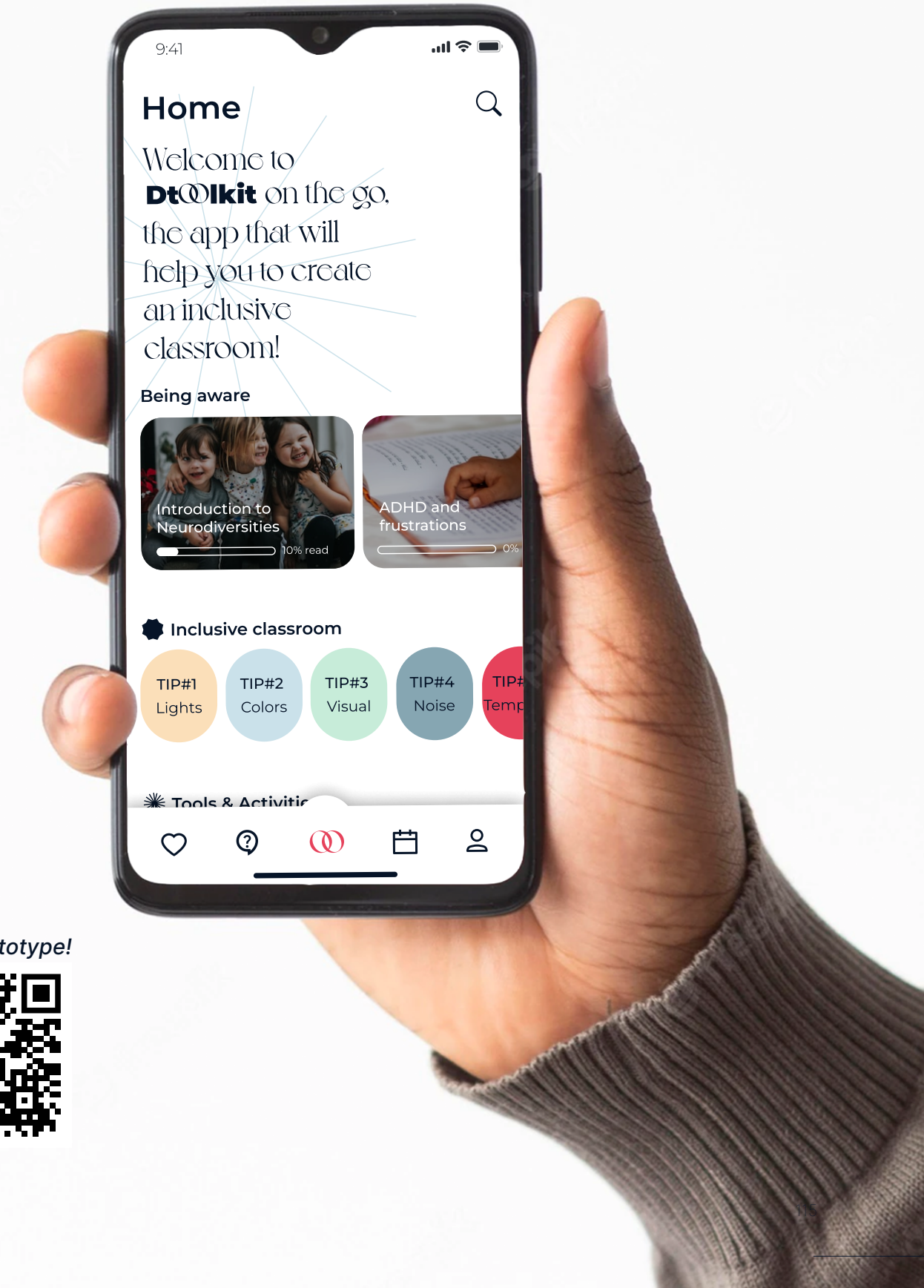






### The App

The App (*Dtoolkit on the go*) is an exclusive service. It is dedicated to all the teachers of the schools who have adopted Dtoolkit, and who have created an account (they can create the account from the web or from the app). In the App, teachers will find the same contents that they can see in the website in a “pocket-sized” format. In this way, they will easily consult whichever information they want, if they need it, or refresh their memory about the steps of the activities. Furthermore, teachers will find 2 other sections: the **chatbot** and the **diary** that are present just in the app because of the quickest and more effective format.



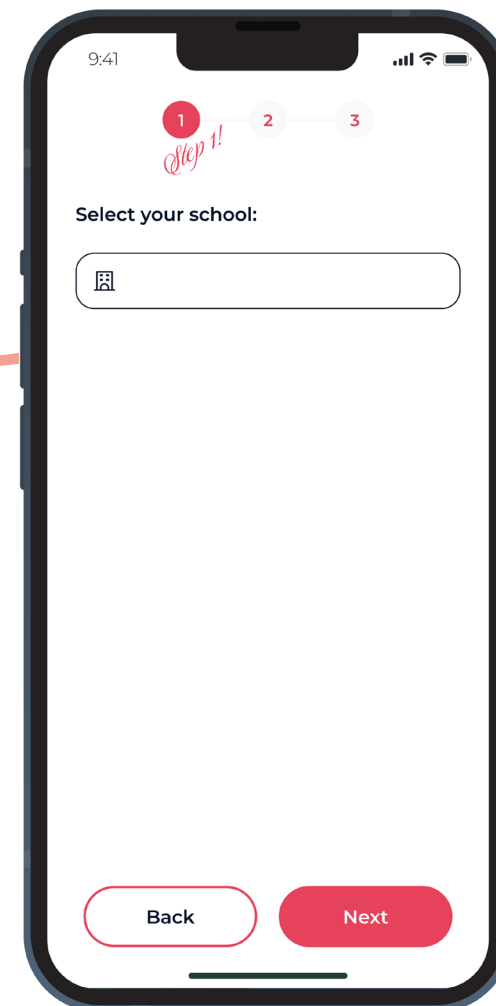
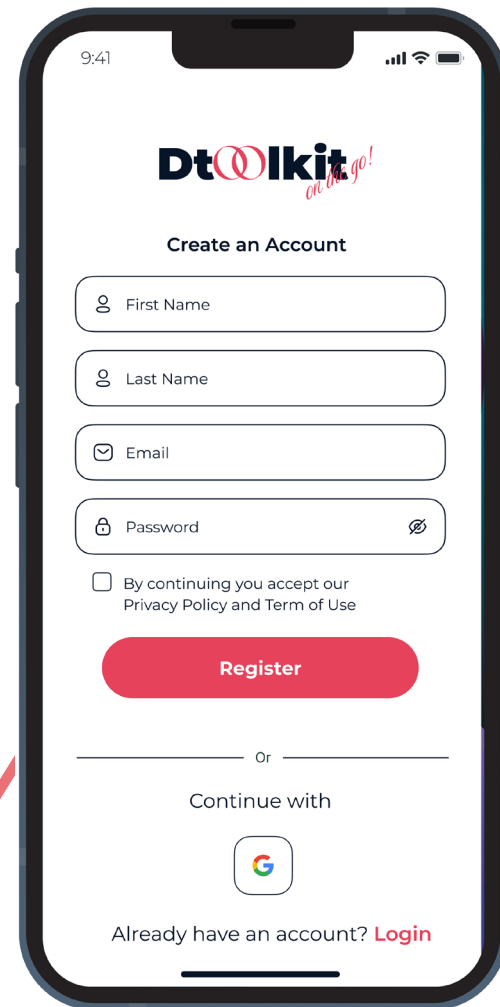
Try the prototype!

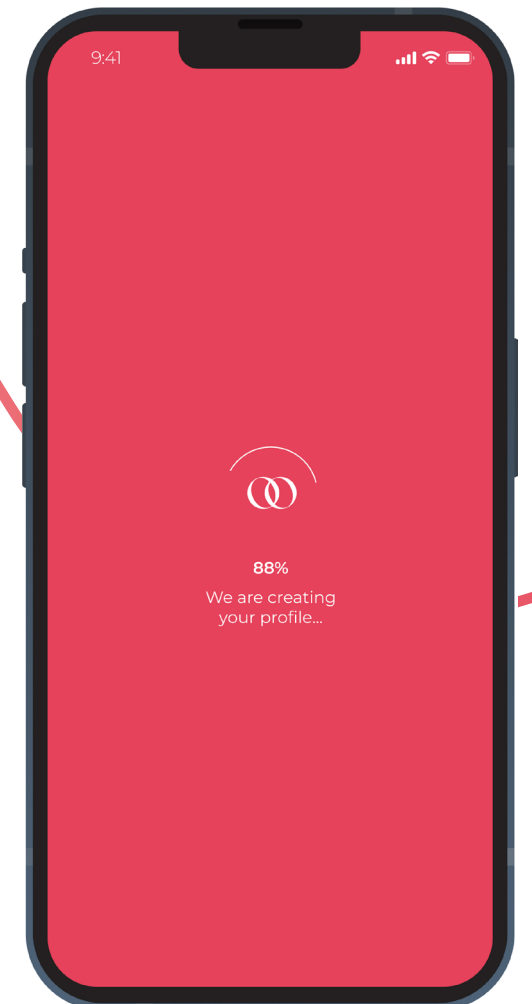
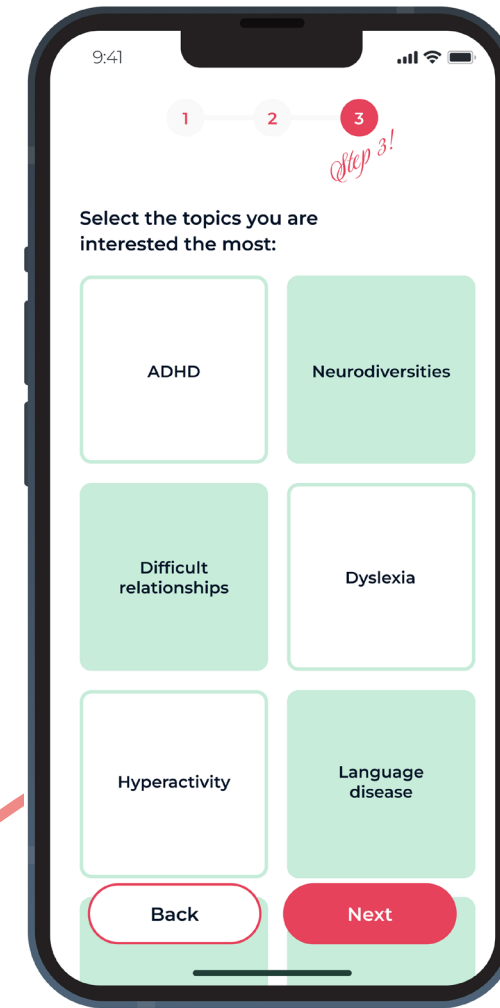
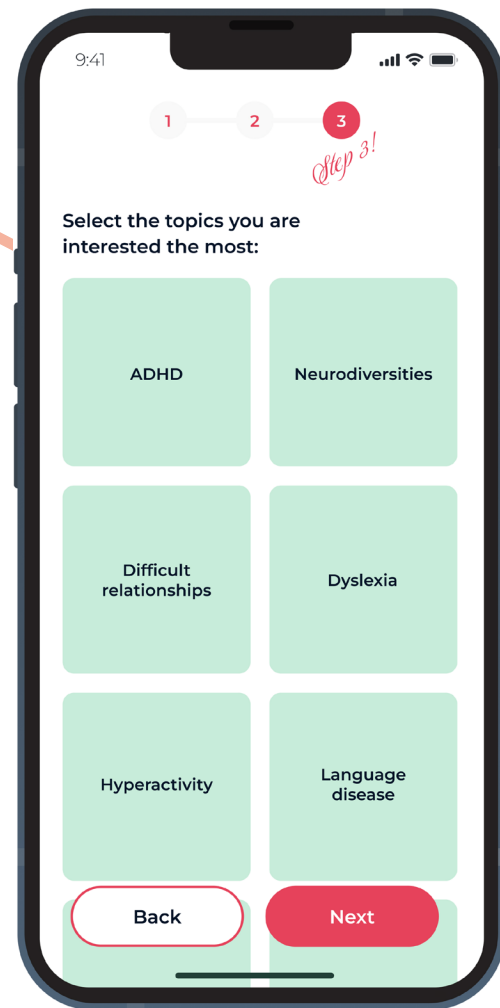
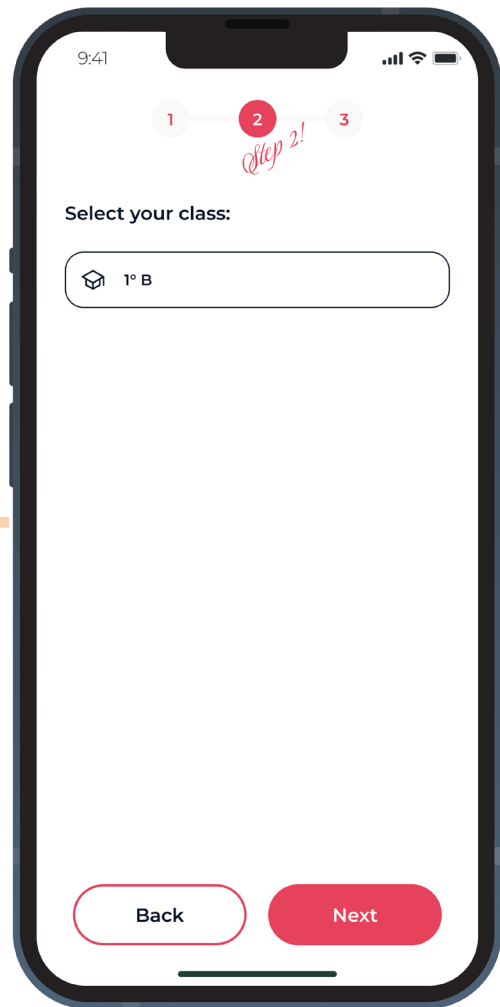


### Login Flow

The Login flow starts with the possibility to sign in or to create an account.

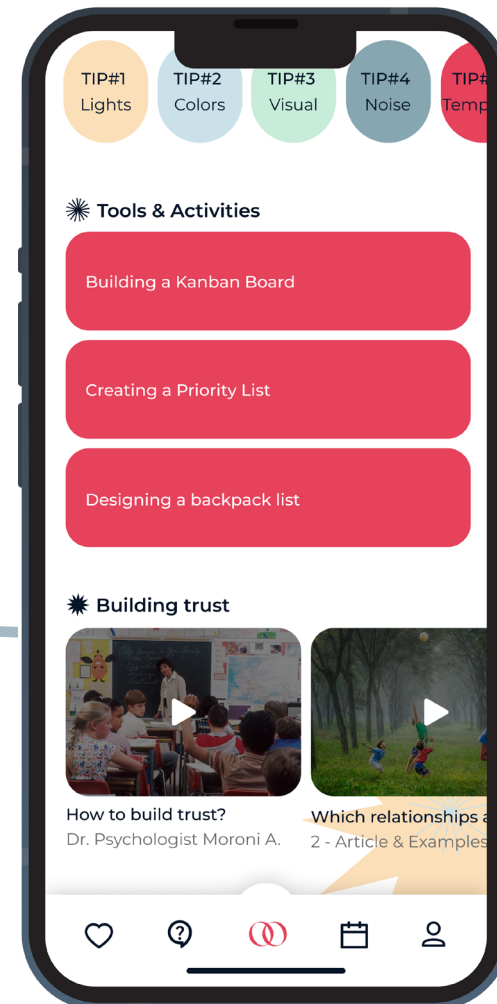
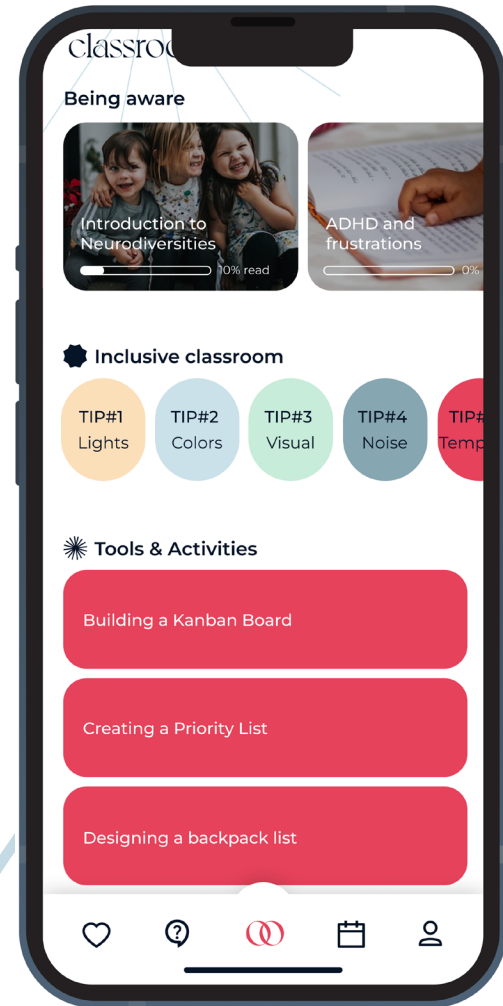
The account creation starts from selecting the school where the user works (that have adopted the platform), the class, then the name and the school e-mail and finally the topics of interest.



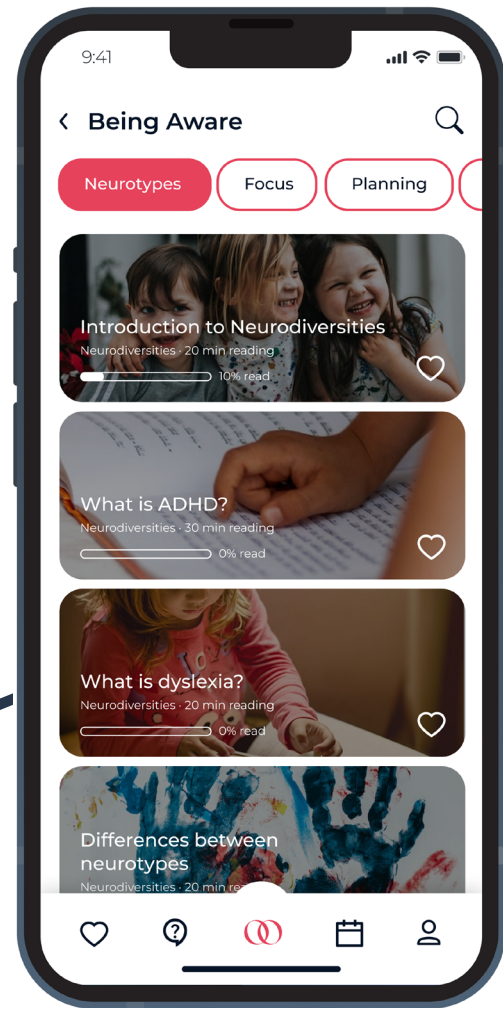


**Dashboard**

The Dashboard includes four main sections that are **Being aware**, **Inclusive classroom**, **Tools & Activities**, and **Building trust**. Clicking into the sections the teachers will have access to all the contents.

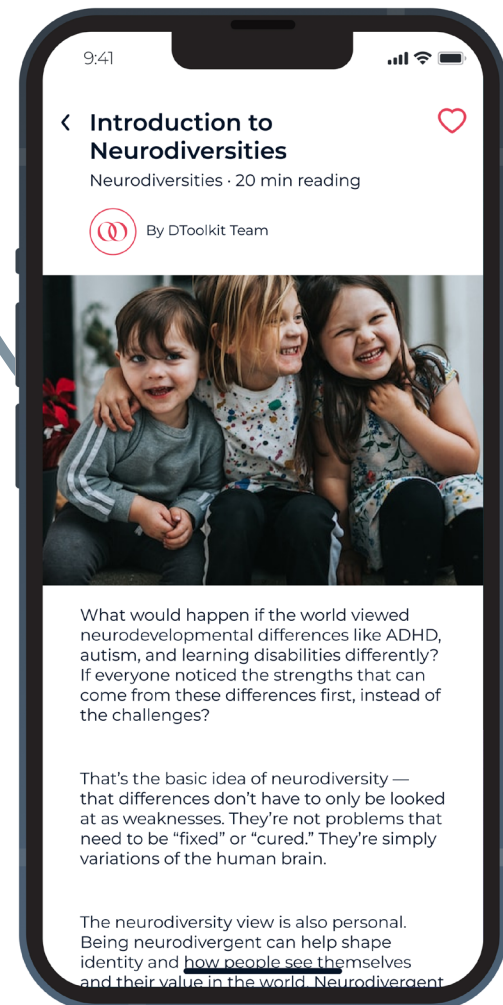






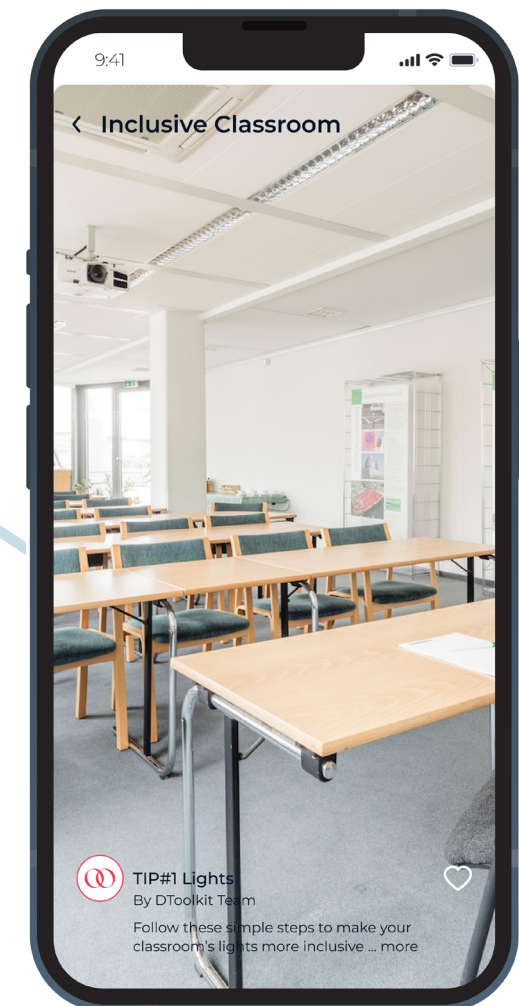
**Being aware**

In this section the user has access to different readings and articles related to the topic of children with neurodiversities, learning cognitive and behavioral disabilities and guidelines about how to create a more inclusive classroom-system.



**Inclusive classroom**

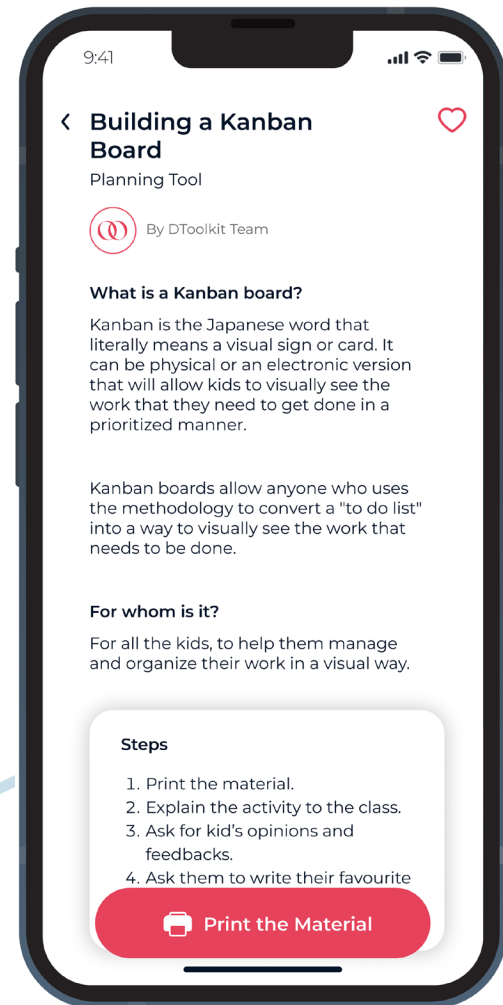
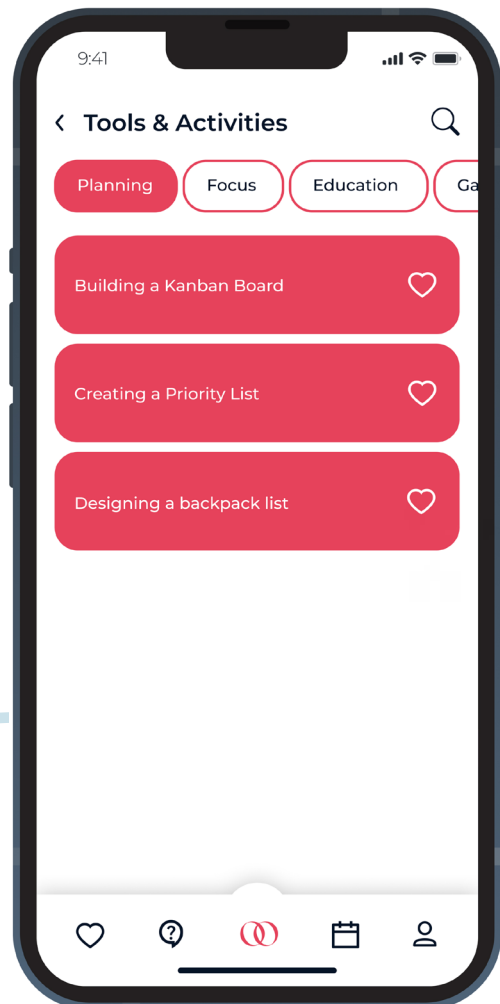
The tips and suggestions about how to create a more comfortable classroom-space are represented into the format of quick videos (of maximum 30 seconds).





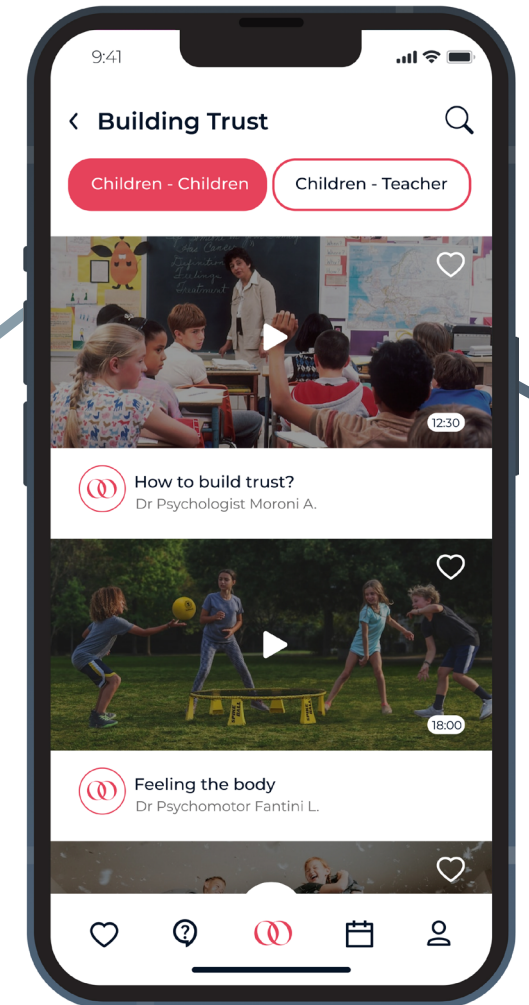
### Tools & Activities

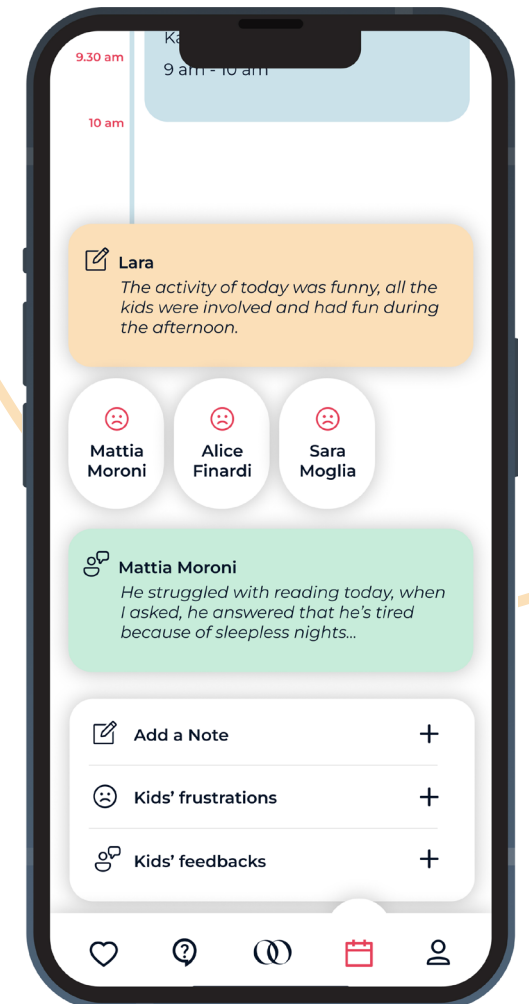
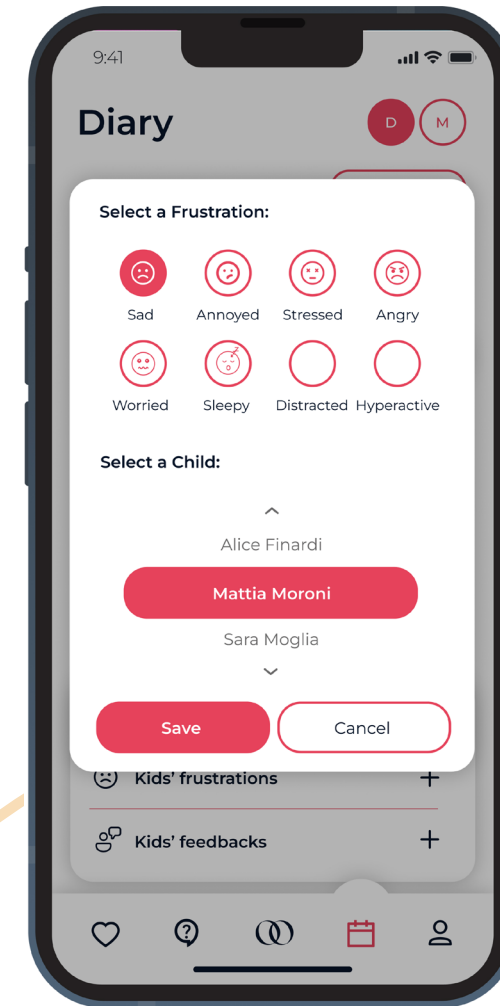
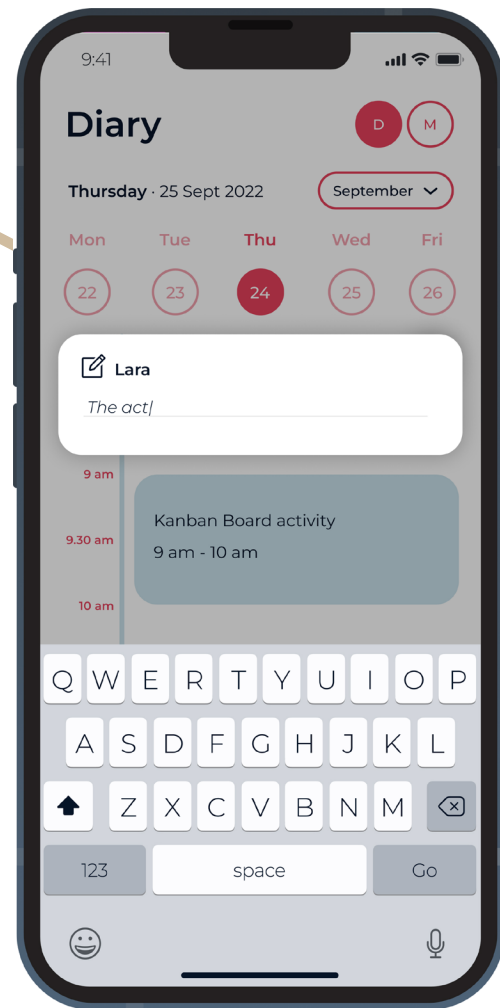
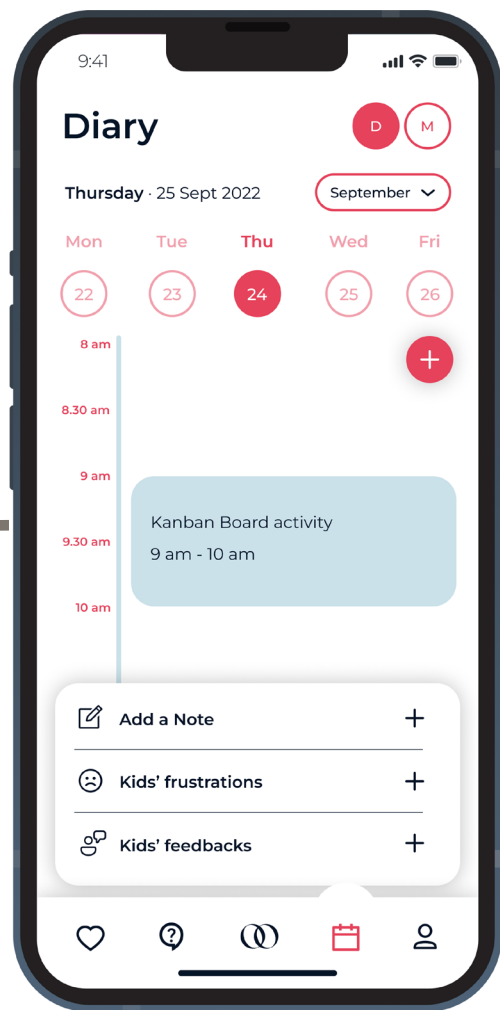
In this section the user can explore different activities to do with children and tools to build in class together. They can clearly see the steps, and they have the possibility to directly print the material from the app.



### Relationships

The section offers a series of videos created by psychologists and speech therapists that contains information about how to establish healthy relationships with children or how to encourage the ones between them.



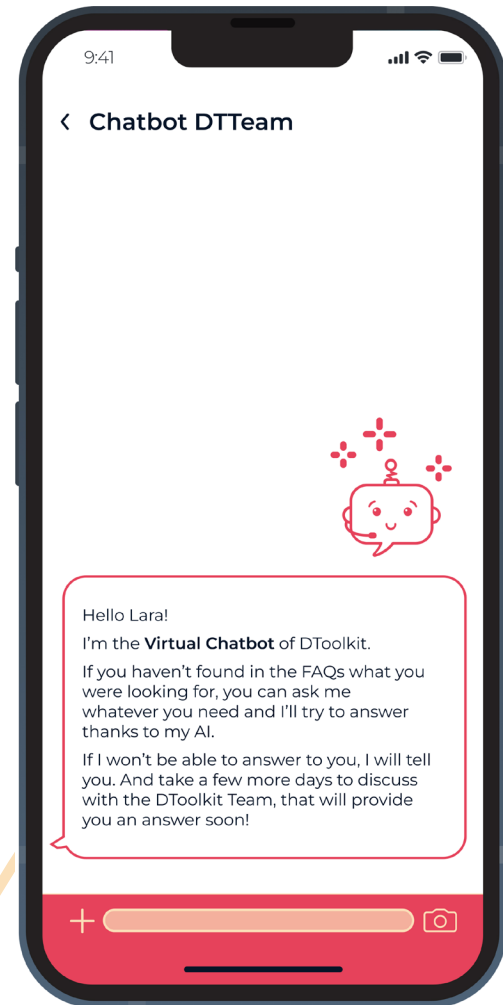
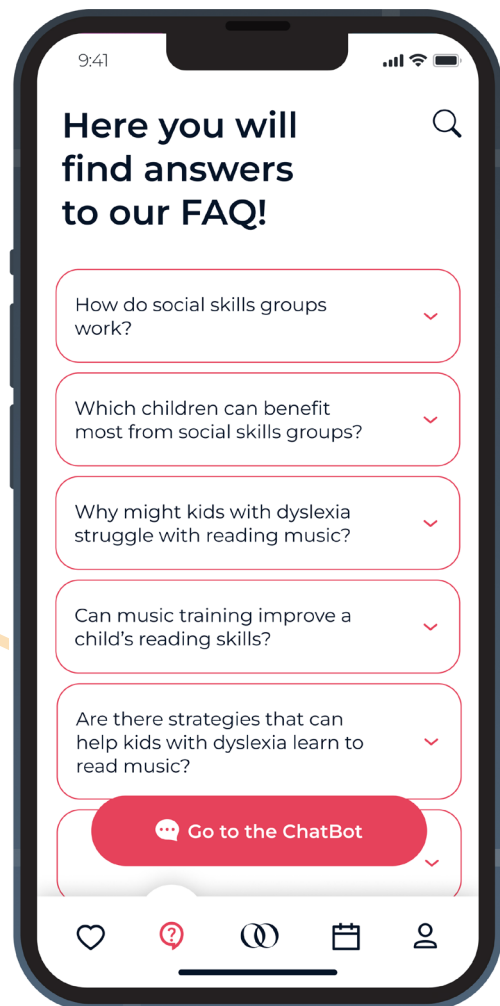


**Diary**

The diary permits teacher of the same class to share a common digital calendar where they can note everyday the activities they do, some important reminders or problems that happened, children's mood and frustrations and children's feedback.

### FAQ and Chatbot

The FAQ section contains a list of specific questions. If the user doesn't find the question that he's looking for, he can ask directly to the chatbot, that will provide for him the answer as soon as possible from the DTeam. Then, the answer will be included into the FAQs.



7.11 BRANDING

Logotype

Dtoolkit Logo is a composition of the words *do + it + together*. The double o in the centre of the name, represent in a symbolical way the concept of working together and adopting a child-centered perspective, that meets the needs of children and hosts their feedback and contribution. The logo for the app is a bit different because it has the double o in red and the disclaimer (*on the go!*) on the right.



Typography

the fonts used for the logo are two: **Montserrat Black** and **Voyage Regular**. For the rest of the branding **Voyage** is mainly used for titles, keywords or eye-catching disclaimers. For the rest it has been used Inter in the whole family. **Montserrat**, instead, has been used for the app.



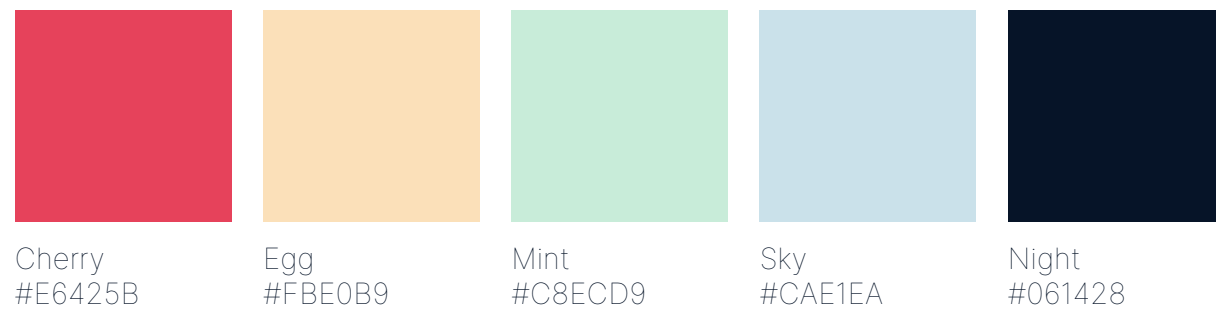
Voyage *Regular and Bold* Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll  
Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv  
Ww Xx Yy Zz  
1 2 3 4 5 6 7 8 9 0

Inter *All family* Aa Bb Cc Dd Ee Ff Gg Hh Ii  
Jj Kk Ll Mm Nn Oo Pp Qq Rr  
Ss Tt Uu Vv Ww Xx Yy Zz  
1 2 3 4 5 6 7 8 9 0

Montserrat *All family* Aa Bb Cc Dd Ee Ff Gg Hh Ii  
Jj Kk Ll Mm Nn Oo Pp Qq Rr  
Ss Tt Uu Vv Ww Xx Yy Zz  
1 2 3 4 5 6 7 8 9 0

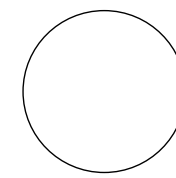
**Colors**

The colors used are the primary colors plus green. The scope is to communicate simplicity, positivity and comfort. There are three pastel colors (Egg, Mint and Sky) and two highly saturated tints (Cherry and Night). The colors are comfortable for the eyes and are connected to the childhood, while the gradients are inspired to the graphic trends related to inclusivity and diversities acceptance.

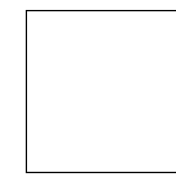
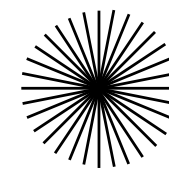
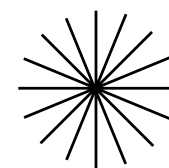


**Shapes**

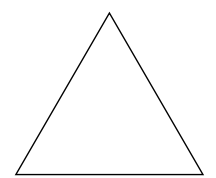
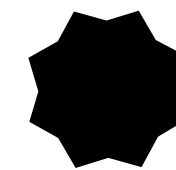
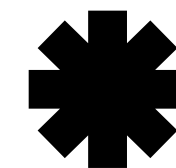
The childish shapes designed are part of the branding of the website and of the app. The design starts from primary shapes: circle, rectangle and triangle, that remind to the dimensions of *time* (circle), *space* (rectangle) and *relationships* (triangle).



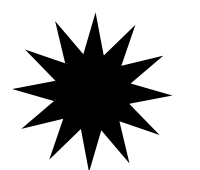
Time



Space



Relationships





**Visual Language**

The visual language is simple but eye-catching. It's a mix of basic childish shapes and pastel colors, that is able to communicate a feeling of comfort and a sense of inclusiveness.



The service **for teachers** that aims to transform primary school into an **inclusive, comfort, and enabling space** for all the children.

## 8. TESTING THE METHOD

### 8.1 SCOPE OF THE TESTING

Before defining the section **Tools&Activities**, that represents the core of the offering, I decided to test the methodology proposed in the Framework (pp.68-69), in order to demonstrate its effectiveness.

"Building a Kanban Board" is the activity that has been co-created with a teacher and tested in a class of the first year of primary school. The scope of the testing was to co-create with the class a tool that should address the frustrations of children with ADHD related to time perception, but that was experimented with all the children of the class. The objective was to demonstrate how this activity could benefit not only those who experience difficulties with focus and time perception, but also the rest of the class.

#### The plan

The activity has been co-created in collaboration with a teacher, Cristina Beretta (*fig. 16*), who helped me in understanding the situation where Dtoolkit could have space of intervention, in choosing the best way to represent the tool and in visualizing the best steps to simplify the activity for the kids.

We started from the pain points to cover, that were:

- To reduce some kids' repetitive requests about what they were going to do during the day;
- To reduce general distraction related to the requests';
- To reduce distraction related to missing information about which would the activities of the day be;
- To help kids improving their autonomy and time perception.

As it has been demonstrated in the case study (pp. 66-67), the Kanban Board is a simple tool coming from the agile methodology that has been tested many times with kids. There is also evidence, as we have seen in the research, that shows how using visual

organization systems with kids with focus and planning difficulties (like autistic or ADHD) could be a life changing solution. For this reason we decided to create this instrument.

The Kanban board would have been designed together with children and would have shown the activities to do, doing and done during the day with the goal to improve their time perception through visualization and to reduce their stress related to missing information.

The entire activity has been tested for 1 month and a half (October 2022 - mid Novembre 2022) in a class of the first year of Aldo Moro primary school in Seregno and the results have been reported within a final questionnaire done both to the children and to the teacher.

### **Cristina Beretta**

29 y.o.  
Primary School Teacher

Cristina has studied in Primary Education Sciences at Bicocca University (Milan).

During the five years on University she has done many internships in different Italian schools, while the last year she decided to fly to Oslo for six months for Erasmus experience and she fell in love with the Norwegian way of teaching.

When she came back, she did another internship at International BES school in Milan. In the thesis she decided to compare the BES school methodology with the schools she had visited in Oslo.

Once graduated, she worked in a bilingual school in Monza for 4 years, then in an international school in Veduggio al Lambro for one year.

Currently for her this is the first year of teaching in a public Primary School: Aldo Moro Primary School, in Seregno (MB).

Cristina has a varied background, she had many enriching experiences and a young talented mind, open to learn new approaches, methodologies, tools and suggestions about how to change the traditional Italian school system. Despite this, it's not easy for her to find trustful sources, and for this reason, she feels a bit frustrated and stressed.

fig. 16 Cristina Beretta's bio

## **8.2 WHAT IS A KANBAN BOARD?**

Kanban is the Japanese word that literally means “visual sign” or “card”. It can be a physical or an electronic version, and it allows people to visually see the work that they need to get done in a prioritized manner. Kanban boards gives anyone who uses the methodology the possibility to convert a “to do list” into a way to concretely visualize the work that needs to be done.

It has been demonstrated by studies conducted by *Scrum.org*(\*) that kids who are taught this way of thinking, start it as a funny game but then it becomes a life-routine way to manage the tasks and work that needs to be done.

### **The dimension of time**

The Kanban Board activity focuses on the dimension of time, which is really relevant especially for kids that have difficulties in focus and organization of tasks, such as kids who experience ADHD. It's not the solution for all their problems, however it's an useful tool that could support and help them in visualizing time dimension and improving planning skills in order to be less stressed.

It has been proven that it works really well with autistic children and even with kids who have ADHD, but what about all the other kids?

Currently, a lot of organizations and companies use this working model to plan the activities and to simplify the work of the employees. It has been demonstrated that the Kanban Board could become an important tool for people while doing their job, because it teaches a way of thinking that helps learning how to be more productive losing less time and decreasing frustrations related to organization dimension.

These are the reasons why the Kanban board seemed to be a valuable tool to test within a class of primary school in order to address the pain points we described in the page before (p.137).

\*<https://www.scrum.org/>

### 8.3 THE STEPS

#### Before interacting with kids

The first phase of the testing was conducted with the teacher and it was composed of a co-design session where we decided how to structure the activity, and of a preparation moment of all the material necessary.

19 September 2022

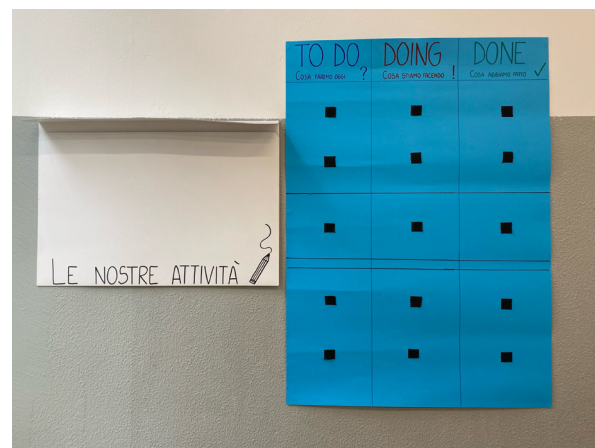
## 1. Co-Creation session to plan the activity

A co-design session together with Cristina has been done with the objective to decide how to plan the activity and how to represent the Kanbann Board depending on the target. Following the goals that kids have to reach at the end of the 1st year of primary school, we decided to prepare one unique board for the class. The kids would have the possibility to understand how the tool works until the end of the 3rd year of primary school, then if the testing would have worked, they could be ready to have a personal board to bring at home.

24 September 2022

## 2. Preparation of the material: creating the board

Cristina prepares a huge paper board with the columns **To do**, **Doing**, **Done** and an envelope to contain the cards with the subjects and with the break activities that will be printed.



26 September 2022

## 3. Preparation of the material: printings

We decide to represent the school subjects on illustrated cards and to plan a brainstorming with the kids to decide the activities for the break times. Cristina finds the material to print in *Dtoolkit on the go* and prims the cards with the drawings of the subjects on papers of different colors.





**Together with kids**

The second phase of the testing was conducted together with the kids. It started with the introduction of the Kanban board asking for their opinion and feedback, then the participatory design session to define together the missing elements of the board, and then the demonstration of the activities and the “do it together” phase.

30 September 2022

**4. Introducing the activity to the children**

Cristina introduces the activity of the Kanban Board to the classroom. She also presented the activities in the envelope and asks for the feedback of the children. The first response is positive: they used to complain a lot about timing and daily organization, so they look interested in the board activity.



3 October 2022

**5. Participatory approach with children**

After a few days, Cristina asks the children to participate in the board creation: they have to tell her which were the activities that they prefer to do during free time at school.

Kids are excited, and tell her a list of things to do during breaks depending on the good/bad weather:

- Reading a book (inside)
- Drawing (inside)
- Playing in class (inside)
- Jumping the rope (outside)
- Playing outside (outside)
- Dancing (outside/inside)

4 October 2022

**6. Preparing and printing the free-time cards**

I prepare illustrations with the free-time activities and Cristina printed them from the app.



6 October 2022

**7. Learning how to use the Kanban board everyday**

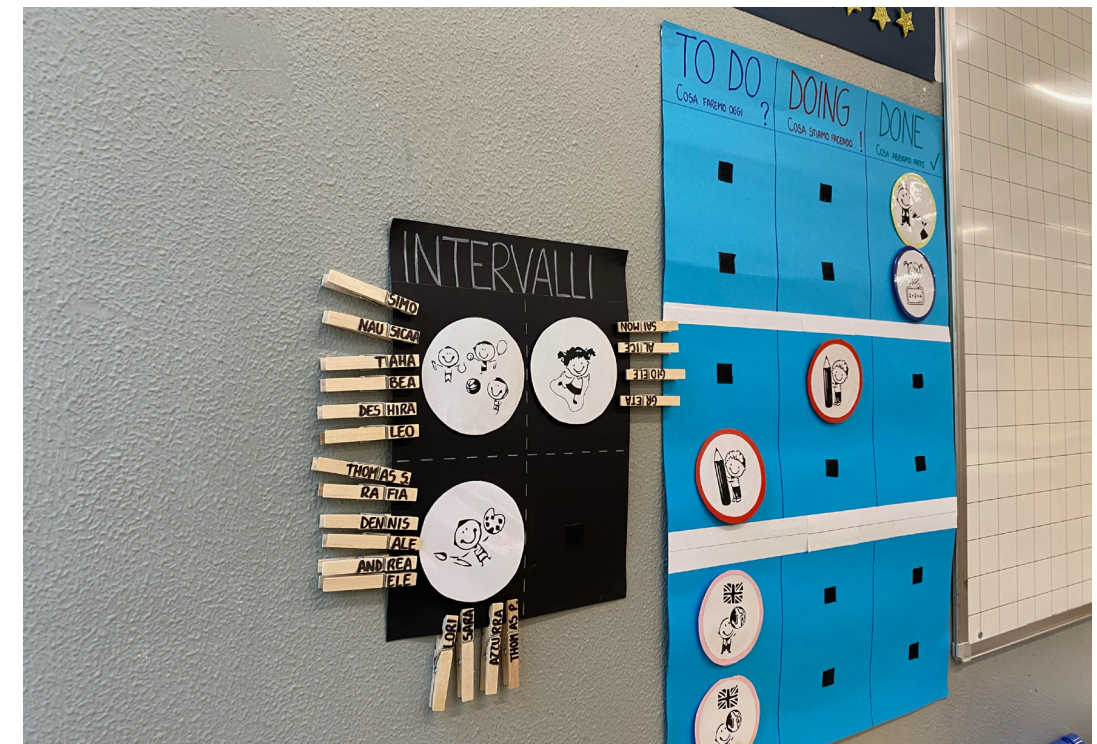
Every morning from the beginning of October, Cristina together with the class completes the board putting all the activities planned for the day in the **To do** column, then during the day in the column **Doing** and **Done**. Hour by hour they move together the activities...





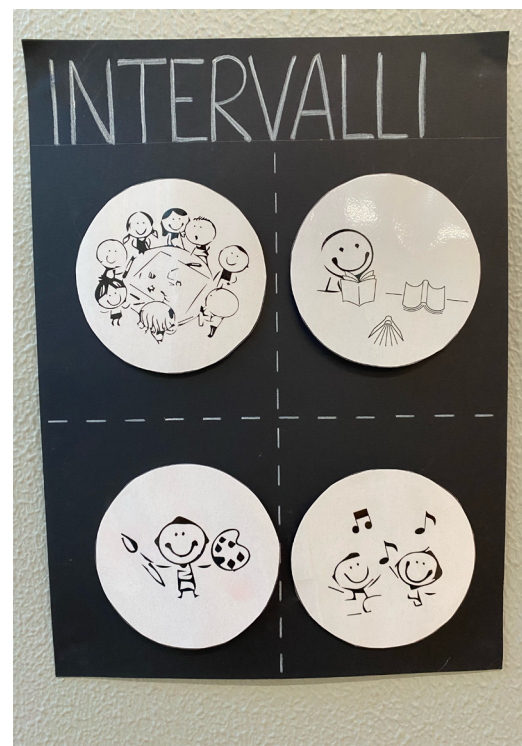
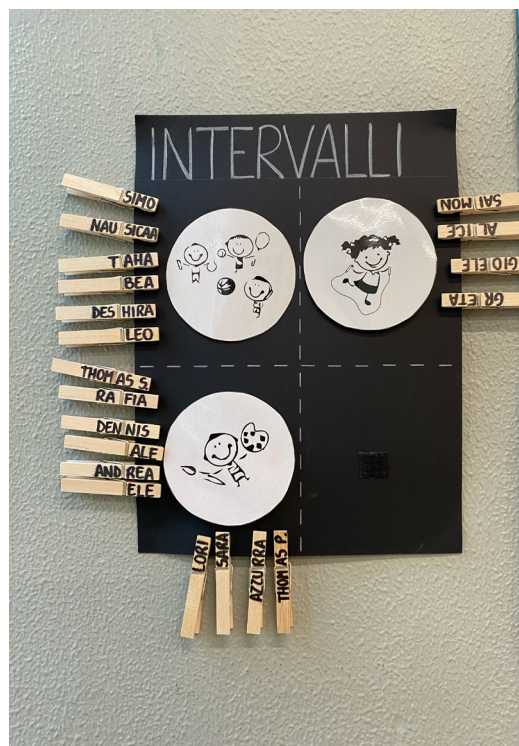
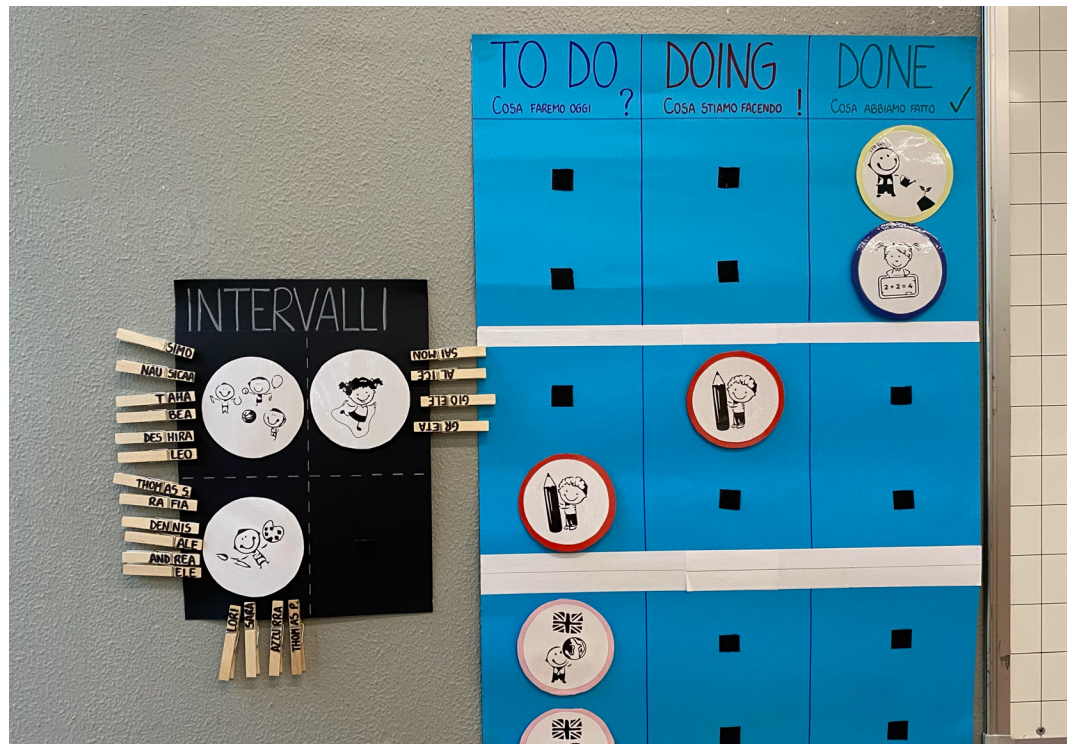


Kanban board, envelope and subjects cards



Kanban board in class





Cristina created another board for the break time with the activities that children can do. Each kid has a clip with his/her name that can put close to the activity he/she prefers.

All the cards of the class 1C





*Kids moving the activities of the day*

## 8.4 INTERVIEWS

From 6 October 2022 to 15 November 2022 Cristina used the board with kids in class. After one month and a half, I asked to Cristina and her kids to complete the following questionnaire in order to collect their opinions and feedback.

### Script

**Indications for the teacher:** during a free brainstorming session all together, ask to the kids what they think about the tool of the Kanban Board. The following questions are just a guideline, if you prefer to reformulate them or to ask for further questions, please do it! It should be a free opinion-exchange moment and the important thing to keep in mind is that nobody should feel tested or judged. Kids should feel free to express their opinion and to tell what they think, because thanks to their comments we can improve the process and the service. Remember also that it's important to write the comments and the quotes of every child.

### Questions for the kids

1. What have you done during the activity of the Kanban board?
2. Was it funny in your opinion?
3. What was unpleasant or hard to do?
4. What would you like to add in the Kanban board activity?
5. Did you feel free to express your opinion during this activity?
6. Has the activity helped you? How?
7. Would you like to use it again?
8. Would you show the activity to your parents? Or to your friends?
9. What else would you like to tell?

### Questions for the teacher

1. Do you think the activity was useful? How much from 1 to 10 (motivate your answer)
2. What was funny (for the kids, from your perspective)?
3. What do you think was boring or hard from their point of view?
4. What could have created confusion or disorientation?
5. After one month of observation, what would you like to add in the Kanban board activity?
6. Do you think that kids were able to freely express themselves during this activity?
7. Will you continue using the Kanban board activity?
8. Would you recommend the activity to other teachers?
9. What else would you like to add?

### Results

#### **Some of the kids's spontaneous feedback and teacher's comments that emerged during the session**

**Thomas P.** (while he's looking it, he points at the Kanban board):  
*«Teacher so this morning we do Italian, then there is break, then we do English, then we go to lunch and in the afternoon you come back and we do art... then we go home right?»*  
 At the teacher's confirmation, Thomas smiled and replied: *«Ok, I understood.»*

**(T) Cristina's comment:** *Thomas often seeks confirmation after filling out the Kanban board in the morning; he wants to know how the day will progress. He doesn't have any specific problem, he's just a very emotional child. During the first few weeks of school he often came at school crying (he missed a lot his family) and often asked when it was time to go home. After the month of October, his morning crying episodes have significantly decreased, and after about 10 days of using the Kanban board, he stopped asking when it was time to leave school and began asking for confirmation if he was interpreting the tool correctly. His approach to the day seems to be strongly improved. I think that by having a concrete visualization of the day's organization, he feels safer.*

**Alice:** *«Teacher now we have finished Italian, I move the card to the "done" and in the "doing" I put math because teacher Giovanna is coming.»*

**Simone:** *«Teacher you forgot to move the card. We finished English, "done", now we have "to do"... We said this morning... Italian!»*

**(T) Cristina's comment:** *The cards were initially moved in the columns by the teachers. After a couple of weeks, we delegated this responsibility to the class secretary (every Monday the secretary changes): at the end of each activity, sometimes with our help and sometimes by himself/herself, the secretary moves the cards showing the class where we are during our school day.*

**Lorenzo:** «Teacher, now I know what we have to do. I don't ask you anymore because you tell us when we arrive at school.»

**Eleonora** (talking to one of her classmates, Yara, while counting the morning cards): «1 and 2... We do two things and then there is the break!»

**Yara:** «Teacher look how many things on the "done"! We have done many things today, we have been busy!»

### Questions for the kids

**Note of the teacher:** some of the responses are to interpret. I transcribed their answers as they were said by the children. Some of the questions received just a few responses, probably because for them it was harder to understand them. They struggled a little bit with some questions because they are still very young, but they also said interesting things. I am happy because I focus a lot on reflection and on the ability to be "critical," after this time I saw that the children have grown so much compared to the beginning of the year.

#### 1. WHAT HAVE YOU DONE DURING THE ACTIVITY OF THE KANBAN BOARD?

**Lorenzo:** it's a blackboard that tells us what we have to do during the day.

**Yara:** there are the subjects to do in the morning and in the afternoon....

**Simone:** There are also breaks, the short one in the morning and the long one after lunch. We can choose what to do in the morning based on the weather because we tell the calendar\* and then we choose what to do.

**Deshira:** the cards show us what we are gonna do in the morning.

\* Simone's «we tell it to the calendar» refers to the routine we have in the morning of filling out a perpetual calendar we have in class with the day of the week, the number of the month, month... and the weather (which often then determines what activities we will do at breaks).

#### 2. WAS IT FUNNY IN YOUR OPINION?

Siiiiii (choral)

**Lorenzo:** well especially for the secretary\*

**Joel:** yes I was moving the cards this week and I liked it.

**Beatrice:** me too last week. I was always able to remember.

**Deshira:** but when is it my turn?

The children suggest her when it's her turn as secretary.

\*Every week the class secretary changes. We all agreed together that it is the secretary's job to fill out and update the KanBan Board.

#### 3. WHAT WAS UNPLEASANT OR HARD TO DO?

The child who had some difficulty at the beginning didn't give a feedback but he has a language difficulty so he probably didn't know what to say or how to say it.

**Beatrice:** teacher at the beginning you reminded us what we had to move, what cards we had to put in the other columns... But now we remind you. They all laughed.

#### 4. WHAT WOULD YOU LIKE TO ADD IN THE KANBAN BOARD ACTIVITY?

Everyone thoughtful expressions.

**Deshira:** I would like to put more activities for the breaks...

**(T) Cristina:** what would you like to add Deshira for our breaks?

**Deshira:** maybe during the year we can change the things we want to do in the breaks, we tell you and you prepare cards

for new things we can do or bring us new games...

**(T) Cristina:** It sounds like a nice idea to change activities! If you think of anything else you would like to do in your breaks tell me and we will update the board. What does everyone else think about this? In chorus they answer me they like the ideas but no one can think of anything else.

#### 5. DID YOU FEEL FREE TO EXPRESS YOUR OPINION DURING THIS ACTIVITY?

In chorus they answer yes.

**(T) Cristina:** okay let's try to think about when we felt FREE to express ourselves...

**Joel:** when I move the cards I do it by myself...

**Thomas:** when we choose what to do during breaks... but I always choose the same thing... because I like it!

**Deshira:** I don't really know...

6. Has the activity helped you? How?

**Thomas P:** I now understand what we have to do... I like to know, it helped me to know what I have to do. \*

**Dennis:** I know which subjects there are that day and which notebooks we use because there are colors.

**(T) Cristina:** and how is the board helping you?

**Lorenzo:** it helps us to count time

**Deshira:** it helps us to see that it passes (time)

**(T) Cristina:** is it like the clock?

**Beatrice:** no teacher we don't know how to read the clock!



**Simone:** *this one yes though! (the Kanban Board).*

\*Thomas is the child who always cried in the morning at the beginning of the year. He, in my opinion (Cristina speaking), feels very reassured by the Board because he knows what he has to do and he knows that his daddy at the end of all the activities will pick him up.

#### 7. WOULD YOU LIKE TO USE IT AGAIN?

**Deshira:** *we keep it yes, because the cards help us to show us what we do.*

**Andrea:** *yes, because then we see what we do all the time and we know. Then here (as he gets up and goes next to the Kanban Board so he shows me up close) there are also the colors so we know which notebooks we have to use or we remember the subjects better.*

#### 8. WOULD YOU SHOW THE ACTIVITY TO YOUR PARENTS? OR TO YOUR FRIENDS?

**Yara:** *my mom have seen it!*

*A number of other children intervened one on top of the other to tell me that their mom and dad had seen it too (we had a class meeting with parents a few weeks ago and I had explained the use of the Kanban Board to them).*

**Simone:** *I would show it to Diego! (A close friend of his in the class next to ours).*

**Yara:** *me to Ilaria (older sister)*

**Sara:** *me too to my sister*

**Simone:** *me to my big brother... and to my cousin too.*

**Deshira:** *me to my new fishes...they are in the new house.*

**Beatrice:** *but how do the fish do that (laughs).*

**Deshira:** *eh I teach them how to do it.*

**Thomas S:** *me to my brother--the one in fifth grade, the big one.*

**Lorenzo:** *me to my dad who never comes to school though...he stays in Arcore (parents separated).*

**Leonardo:** *my grandfather sees it in the morning.*

**(T) Cristina:** *oh that's nice. And did you explain to him how we use it?*

**Leonardo:** *yes!*

*The children are proud of the Kanbab Board!*

#### 9. WHAT ELSE WOULD YOU LIKE TO TELL?

Noone added anything.

#### Questions for the teacher

##### 1. DO YOU THINK THE ACTIVITY WAS USEFUL? HOW MUCH FROM 1 TO 10 (MOTIVATE YOUR ANSWER)

**(T) Cristina:** *The activity was very useful for first graders so, from 1 to 10, I would say 10. I noticed that the children, having a tool where they could concretely visualize the day, became aware of the time perception. Building this concept with 6-year-olds is not easy because the idea of time is not "innate" and, like everyone else, children perceive school time subjectively: some perceive the day as a very long series of activities, others experience it with extreme serenity, never desiring to go home again. The Kanban board is helping children to perceive time more "objectively" and precisely thanks to its visible and concrete indicators, and is helping children to understand the concept of sequentiality. I had already tried to use a board organized weekly in order to allow children to visualize the activities: I had glued on the board tiles with the different subjects according to the timetable set by the school.*

*I found the Kanban Board more useful for the children but even for me as a teacher, because I think it's more flexible: with a weekly board, I often had to explain to the children that I had to change subjects and for this reason it happened to do something different than what was on the board. With a daily tool, instead, the children's attention is more focused on the progress of the day they are experiencing in the here and now. Furthermore, for us as teachers, it is more effective because we have the possibility to organize the days on the needs of the class, on special events we decide to join,*

*or on changes that happened the day before.*

##### 2. WHAT WAS FUNNY (FOR THE KIDS, FROM YOUR PERSPECTIVE)?

**(T) Cristina:** *It has been funny for the children to move the tiles related to classroom activities both because it is a goal for them to finish a task and because they love to move the Velcro cards. Also, I think they feel autonomous and satisfied when it is their turn to take care of the Kanban board.*

##### 3. WHAT DO YOU THINK WAS BORING OR HARD FROM THEIR POINT OF VIEW?

**(T) Cristina:** *It took a couple of weeks to get most of the children comfortable with the tool. A couple of children in the class (one has an IEP and the other has a learning disability), even after two weeks, need someone to read the sequence of activities for them. But I think they just need a few more time*

##### 4. WHAT COULD HAVE CREATED CONFUSION OR DISORIENTATION?

**(T) Cristina:** *The clothespins to choose the break activities were perhaps a bit limiting in some cases especially for the post lunch break (that is very long because it lasts one hour). Children, during the whole course of the break, felt "obliged" to do just one activity. After a few weeks, we agreed on independently moving the clothespin even during the post-meal break in order to change the activities.*

*In addition, a lot of cooperation is needed within the teaching team working in the same classroom: the use of the tool becomes part of the daily routine if each*

teacher uses it properly together with the children. At first, even this small part was hard because some colleagues forgot to update the board.

5. **AFTER ONE MONTH OF OBSERVATION, WHAT WOULD YOU LIKE TO ADD IN THE KANBAN BOARD ACTIVITY?**

**(T) Cristina:** I would add a section on children's "mode" of leaving school by adding a band in which to list the most common modalities: after-school, leaving with family, leaving with a friend, leaving early. Close to the modalities, children, in the morning as soon as they enter school, could stick the clothespin with their name next to their exit mode in order to stimulate again their autonomy, awareness of themselves and what is going on.

6. **DO YOU THINK THAT KIDS WERE ABLE TO FREELY EXPRESS THEMSELVES DURING THIS ACTIVITY?**

**(T) Cristina:** In my opinion, proposed in the collective mode as we did, the Kanban board doesn't promote children's self-expression but helps them to manage their time and to become more aware of it. This kind of visualization of the Kanban board, in my opinion, is fundamental for children (especially young children) to learn how to use the tool properly, to learn its usefulness, and to develop time awareness and perception of what surrounds them. When they will have their own Kanban board, it could definitely be a tool in which they would feel free to express themselves but

to get to that point, small steps are needed before.

7. **WILL YOU CONTINUE USING THE KANBAN BOARD ACTIVITY?**

**(T) Cristina:** Absolutely. It is helping the children a lot, and I think that I will keep the tool throughout all the primary school cycle so that it will always accompany them and, they will gradually become more and more autonomous in the time management. One goal I would like to achieve with them is to build one Kanban board for each so that they can learn to manage themselves the time and become completely independent.

8. **WOULD YOU RECOMMEND THE ACTIVITY TO OTHER TEACHERS?**

**(T) Cristina:** Yes. I have already talked about it with some colleagues and friends who do my job. Two colleagues from the two classes parallel to mine have already created the board and are starting to use it just now (end of October) with the children as well.

9. **WHAT ELSE WOULD YOU LIKE TO ADD?**

**(T) Cristina:** Actually just thank you for your precious help!

## 8.5 RESULTS

I would like to show you a brief journey map of the testing session, together with a summary of the most meaningful insights and results that emerged after the interviews.

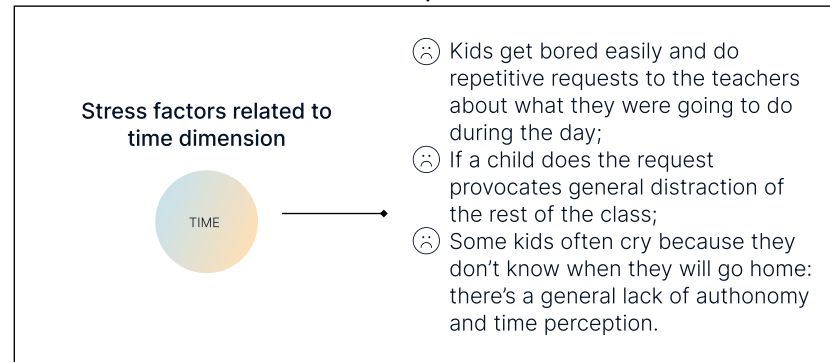
In the map (fig.17), you can clearly visualize how, starting from the problem related to time management, we got to the correspondent HMW question, we used the elements of the framework and we formulated the concept: to co-create a Kanban board with the entire class.

The objective of providing to the whole classroom a tool to improve the environment making it more comfortable and of reducing the time-related stress factors experienced by neurodiversities, was excellently reached. It has even exceeded the expectations because Cristina decided to keep the board until the end of the primary school cycle and to start helping kids in building a personal board, plus she shared the activity with the other teachers of the schools that will use it soon.

The results of the experimentation were incredibly satisfying even from the kid's perspective, that left a lot of space to their imagination for the improvement of the activity.

fig.17 Testing session journey and insights

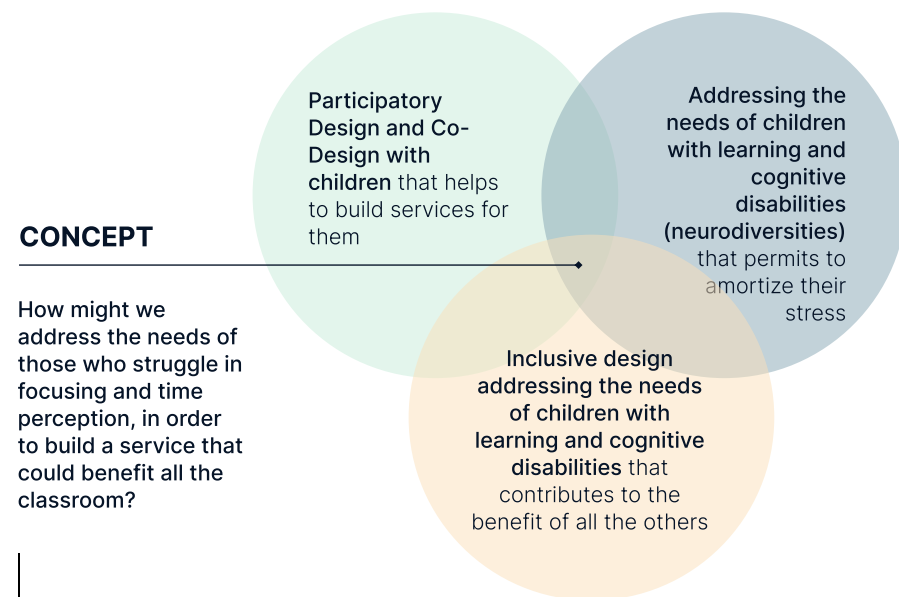
**1. PROBLEMS**



**2. HMW**

How might we help teachers of primary school creating a more inclusive and comfortable classroom-system exploring the dimensions of space, time and relationships?

**3. FRAMEWORK**



**4. A CLASSROOM KANBAN BOARD**

The **Kanban board** has the scope to allow children **visualizing** the activities that they have to do, the ones that they are doing and the ones they have done. It should permit to improve their time perception and together with it also their focus and attention.

**6. CHILDREN'S FEEDBACK**

The kids responded to the questionnaire with energy and enthusiasm about the Kanban board:

- ☺ While before they frequently needed to ask the teacher what they would have done during they day, now they are able to see it **independently**, sometimes they just ask for confirmation;
- ☺ They recognize the board as an instrument that helps them **reading time**;
- ☺ They feel **proud of the board**, and they improve their **autonomy** when they are in charge of moving the cards;
- ☺ They are also proud to be considered in the **co-design** process of the board;
- ☺ They stopped asking when they have to go home, and feel more relaxed and **less stressed** by the time.

«Teacher, now I know what we have to do. I don't ask you anymore because you tell us when we arrive at school.»  
(Lorenzo)

«Teacher look how many things on the "done"! We have done many things today, we have been busy!»  
(Yara)

Teacher: «How is the board helping you?»  
Lorenzo: «It helps us to count time»  
Teacher: «Is it like the clock?»  
Beatrice: «No teacher we don't know how to read the clock!»

**5. TEACHER'S FEEDBACK**

TESTING THE BOARD...

Cristina responded to the questionnaire with positive feedback about the activity:

- ☺ The daily board is **effective for teachers** because they have the possibility to organize the day based on the needs of the class, and **for children** because they are focused on the progress of the day and on the "here and now";
- ☺ Kids are able to **visualize** in the information by themselves and to improve their autonomy by taking care of the board;
- ☺ **Together with children**, they agreed on independently moving the clothespins even during the post-meal break in order to change the activities, because they found it a bit limiting, this means **they co-decided how to improve** the board;
- ☺ One of the children who used to cry every morning because he wanted to go home, started feeling reassured by the Kanban board and stopped crying.

«I noticed that the children, having a tool where they could concretely visualize the day, became aware of the time perception.»

«Also, I think they feel autonomous and satisfied when it is their turn to take care of the Kanban board.»

«This kind of visualization of the Kanban board, in my opinion, is fundamental for children (especially young children) to learn how to use the tool properly, to learn its usefulness, and to develop time awareness and perception of what surrounds them.»

## 9. CONCLUSION

### 7. EXCEEDING THE EXPECTATIONS!

- The teacher will continue using the Kanban board throughout all the primary school cycle because she thinks it's a valuable tool that will help the children gradually become more and more autonomous in the time management.
- The teacher would like to guide her kids to realize a mini-personal Kanban board at the end of the 3rd year.
- The teacher has shared the Kanban Board activity with her colleagues of the school who will start using it soon with their classes.
- Children are happy and proud of their Kanban class board and would like to show it to everybody!

**«One goal I would like to achieve with them is to build one Kanban board for each so that they can learn to manage themselves the time and become completely independent.»**  
(Teacher C.)

### 8. OPEN POINTS AND OPPORTUNITIES

Both Cristina and the kids responded with their personal opinion to the question "What would you like to add/change in the Kanban board activity?". This made me think about possible opportunities about how to improve the service...

**«I would add a section on children's "mode" of leaving school by adding a band in which to list the most common modalities: after-school, leaving with family, leaving with a friend, leaving early. Close to the modalities, children, in the morning as soon as they enter school, could stick the clothespin with their name next to their exit mode in order to stimulate again their autonomy, awareness of themselves and what is going on.»**  
(Teacher C.)

**«Maybe during the year we can change the things we want to do in the breaks, we tell you and you prepare cards for new things we can do or bring us new games...»**  
(Deshira)

### OPEN POINTS AND OPPORTUNITIES

As we have seen, the results of the testing month were positive. The objective of using a tool that addressed the needs of children with ADHD, with the entire class was reached in just one month. The stress factors of the children related to the time dimension effectively improved, in particular it helped kids in:

- Having a clear **visualization of time** and of what they have to do during the day. All the children (especially those who are more sensitive and in need of confirmations) after one month, started **feeling** more **relaxed** and stopped asking to the teacher what they were going to do during the day.
- **Being** more **autonomous**, taking confidence with time perception and feeling proud of themselves in taking care of the object.
- The Kanban Board **helped some children** who needed to be continuously reassured about the arrival of their parents in the afternoon, to understand by themselves the flow of time.

Furthermore, the results have exceeded the expectations. Interesting insights have emerged together with delightful opportunities in Dtoolkit's orizons, in particular :

- The teacher will continue using the Kanban board throughout all the primary school cycle because she thinks it's a valuable tool that will help the children gradually become more and more autonomous in the time management;
- The teacher would like to guide her kids to realize a mini-personal Kanban board at the end of the 3rd year;
- The teacher has shared the Kanban Board activity with her colleagues of the school who will start using it soon with their classes;
- Children are happy and proud of their Kanban class board and would like to show it to everybody!

### How might we improve Dtoolkit?

With the question *What would you like to add in the Kanban board activity?* interesting ideas have emerged about how to improve the board, based on children's and teacher's needs. One of the kids proposed to add activities for breaks and to

change them cyclically. All the children seemed to appreciate this option.

This question made me think a lot about Dtoolkit and I thought about how to improve it in order to make it more child-centered, giving even more space to the kids for contributing in order to design services that could make them feel better.

Some ideas came up to my mind.

- What about making regular interviews to do in circle together with children, asking for feedback about the activities (continuous-feedback model) with the goal to reinforce children's participation?
- What about increasing the level of interaction for teachers, making it more profound and creating a space where they could have the possibility to post the tools and activities after months of testing with children and to take inspiration by those of the others?
- What about creating a real child-teachers centered community?

The opportunities are varied and all very interesting.

In conclusion, I would like to add that I have been able to prove that a service that aims to support teachers and kids involving them in co-design sessions could be a solution for building a comfortable context at school that we could define safe and enabling.

Taking care of children's opinion and feedback is one of the pillars of Dtoolkit and this can be done in different ways, the important is to start from children's needs and perspective, to include them in the creation process, and to personalize the context making it unique and suitable to the situation.



# BIBLIOGRAPHY AND SITOGRAPHY

## CHAPTER 1

- British Design Council (2015). *Design Council: Design methods for developing services*. Available at: <https://www.designcouncil.org.uk/our-work/skills-learning/resources/design-methods-developing-services/>

## CHAPTER 2

- Austin RD and Pisano GP (2017) *Neurodiversity as a competitive advantage*. Harvard Business Review, May–June: 96–103. Available at: <https://hbr.org/2017/05/neurodiversity-as-a-competitive-advantage?msclkid=1432a89eaf4011ec8add174ad4ab713a> (accessed 23 April 2022).
- Baumer N., MD, MEd, Contributor, and Frueh J., MD, Guest Contributor (November, 2021). *What is neurodiversity?* Available at: <https://www.health.harvard.edu/blog/what-is-neurodiversity-202111232645#:~:text=Neurodiversity%20describes%20the%20idea%20that,are%20not%20viewed%20as%20deficits>.
- BCO (British Council of Offices), (2022). *DESIGNING FOR NEURODIVERSITIES*.
- Disable World (2022). *What Is: Neurodiversity, Neurodivergent, Neurotypical*. Available at: <https://www.disabled-world.com/disability/awareness/neurodiversity/#:~:text=The%20term%20originated%20in%20the,referred%20to%20as%20%22neurodivergent%22>.
- Ministero dell'Istruzione, dell'Università e della Ricerca Dipartimento per l'Istruzione Direzione Generale per lo

Studente, l'Integrazione, la Partecipazione e la Comunicazione Ufficio 6, (2010) Prot. N. 4089-15/6/2010. Oggetto: *Disturbo di deficit di attenzione ed iperattività*. Accessible at: [https://www.liceomachiavelli-firenze.edu.it/com/file/DIDATTICA/INCLUSIONE/Alunni%20ADHD\\_C.M.%204089\\_15\\_giugno\\_2010.pdf](https://www.liceomachiavelli-firenze.edu.it/com/file/DIDATTICA/INCLUSIONE/Alunni%20ADHD_C.M.%204089_15_giugno_2010.pdf)

- Rudy J.L. (2022). *What Does "Neurotypical" Mean?* Available at: <https://www.verywellhealth.com/what-does-it-mean-to-be-neurotypical-260047>

## CHAPTER 3

### Books

- Brewer J., *The Craving Mind: From Cigarettes to Smartphones to Love – Why We Get Hooked and How We Can Break Bad Habits*. Yale University Press, February 6, 2018
- Dr Dow M., *The Brain Fog Fix: Reclaim Your Focus, Memory, and Joy in Just 3 Weeks*. Hay House Inc., December 13, 2016
- Matè G., *Scattered Minds: The Origins and Healing of Attention Deficit Disorder*. Random House Uk, January 3, 2019
- Sapolsky R., *Behave: The Biology of Humans at Our Best and Worst*. Penguin Press. 2 May 2017, pp. 250-260.

### Url

- American Academy Of Child & Adolescent Psychiatry, *ADHD & The Brain*, No. 121. Available at: [https://www.aacap.org/AACAP/Families\\_and\\_Youth/Facts\\_for\\_Families/FFF-Guide/ADHD\\_and\\_the\\_Brain-121.aspx](https://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/ADHD_and_the_Brain-121.aspx)
- BCO (British Council of Offices), (2022). *DESIGNING FOR NEURODIVERSITIES*.
- Bonati M., Scarpellini F., Cartabia M., Zanetti M. and on behalf of the Lombardy ADHD Group, (July, 2021). *Ten Years (2011–2021) of the Italian Lombardy ADHD Register for the Diagnosis and Treatment of Children and Adolescents with ADHD*. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8304222/>.
- Center for Disease, Control and Prevention, (2022). *What is ADHD?* Available at: <https://www.cdc.gov/ncbddd/adhd/facts.html#:~:text=ADHD%20is%20one%20of%20the,%2C%20>

or%20be%20overly%20active.

- Greenwood, C. R., & Delquadri, J. (1995). *Classwide peer tutoring and the prevention of school failure. Preventing School Failure.* 39(4), 21-25.
- Conca A., Raponi A., Gozzi G., Tommasino S., Morsiani A., Rafanelli C., Innamorati M., Holzer S., Florio V., Giupponi G., *ADHD: a study on evaluation and treatment pathways in Italian Mental Health Service.* Novembre-Dicembre 2021, Vol. 56, N. 6, Riv. Psichiatr. 2021; 56(6):300-307. Available at: <https://www.rivistadipsichiatria.it/archivio/3713/articoli/37043/>
- Estante R., (2015), *An Interview with Dr. Julie Schweitzer – Part I.* Available at: <https://add.org/an-interview-with-dr-julie-schweitzer-part-i-2/>
- Faraone, S. V., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M. A., . . . Wang, Y. (2021). *The World Federation of ADHD International Consensus Statement: 208 evidence-based conclusions about the disorder.* Neuroscience & Biobehavioral Reviews. doi:10.1016/j.neubiorev.2021.01.022
- Main P., (2020). *Neurodiversity In The Classroom: A Teacher's Guide.* Available at: <https://www.structural-learning.com/post/neurodiversity-in-the-classroom-a-teachers-guide>
- Scheuermann, B. K., & Hall, J. A. (in press). *Positive behavioral supports for the classroom* (3rd ed.). Boston, MA: Pearson
- Young S. and J. Amarasinghe M., Practitioner Review: *Non-pharmacological treatments for ADHD: A lifespan approach.* Institute of Psychiatry, King's College London, UK-Journal of Child Psychology and Psychiatry 51:2 (2010), pp 116–133. Available at: <https://www.airipa.it/wp-content/uploads/2013/04/TratADHD010-1.pdf>

## CHAPTER 4

### Link Case studies:

- Website: *Understood.com* (<https://www.understood.org/>)
- Website: *habitinspiringplatform.com* (<https://www.habitinspiringplatform.com/>)

- Welcome to BES. Available at: <https://www.beschool.eu/it/chi-siamo/benvenuti-alla-bes>
- Strumenti tecnologici per l'autonomia e l'apprendimento, (2014-2022) Anastasis Società Cooperativa Sociale, Available at: <https://www.anastasis.it/strumenti-compensativi/>

## CHAPTER 5

- Agile for Kids, (2020), *Agile for Kids.* Available at: <https://thinkagile.co.za/agile-for-kids/>
- Benton L., Johnson H., ( 2014). *Can targeting the needs of children with autism provide benefits for a broader child population?* Available at: <https://www.researchgate.net/scientific-contributions/Hilary-Johnson-70946955>
- Children Design Guide (July, 2022), *D4CR Designing for children's rights* Available at: <https://childrensdesignguide.org/principles/>
- Hansen A. S., (2017), *Co-Design with Children: How to best communicate with and encourage children during a design process.* Department of Design Norwegian University of Science and Technology. Available at: ([https://www.ntnu.edu/documents/139799/1279149990/13+Article+Final\\_anjash\\_fors%C3%B8k\\_2017-12-07-20-11-11\\_Co-Design+with+Children+-+Final.pdf/b8dd19c4-d2b1-4322-a042-718e06663e13#:~:text=Co%2Ddesign%20with%20children%20often,on%20a%20mutual%20learning%20experiences.](https://www.ntnu.edu/documents/139799/1279149990/13+Article+Final_anjash_fors%C3%B8k_2017-12-07-20-11-11_Co-Design+with+Children+-+Final.pdf/b8dd19c4-d2b1-4322-a042-718e06663e13#:~:text=Co%2Ddesign%20with%20children%20often,on%20a%20mutual%20learning%20experiences.))
- Kalliomeri R., Mettinen K., Ohlsson A., Tulensalo H., (2020), *Child-Centered Design, Save the Children Finland.* Available at: <https://resourcecentre.savethechildren.net/document/child-centered-design/#:~:text=Child%2Dcentered%20design%20combines%20service,and%20meaningful%20for%20all%20children.>

## LIST OF FIGURES

- Fig. A (p. 25), *Back to school*. Available at: <https://unsplash.com/photos/GDokEYnOfnE>
- Fig. B (p. 33), *How SEL helps you as a teacher*. Available at: <https://www.understood.org/en/articles/how-sel-helps-you-as-a-teacher>
- Fig. C (p. 39), *Understood.com*. Screenshot by <https://www.understood.org/>
- Fig. D (p. 41), *habitinspiringplatform.com*. Screenshot by <https://www.habitinspiringplatform.com/>
- Fig. E (p. 43), *Bilingual European School*. Available at: <https://progroup-niguarda.it/prova/istituti-privati/237-bilingual-european-school>
- Fig. F (p. 43), *Structure and Facilities*. Available at: <https://www.beschool.eu/en/about-us/facilities-and-services>
- Fig. G (p. 43), *Perchè la BES?* Available at: <https://mumadvisor.com/perche-la-bes/>
- Fig. H (p. 43), *Structure and Services*. Available at: <https://www.beschool.eu/en/about-us/facilities-and-services>
- Fig. I (p. 43), *Bes giardino 1*. Available at: <https://www.beschool.eu/it/chi-siamo/benvenuti-alla-bes>
- Fig. L (p. 45), *Anastasis.com*. Screenshot by <https://www.anastasis.it/strumenti-compensativi/>
- Fig. M (p. 63), *ADHD*. Available at: <https://unsplash.com/s/photos/adhd>
- Fig. N (p. 65) *Child-centered Design*. Screenshot by <https://resourcecentre.savethechildren.net/document/child-centered-design/#:~:text=Child%2Dcentered%20design%20combines%20service,and%20meaningful%20for%20all%20children.>
- Fig. O (p. 67), *Agile for Kids*. Available at: <https://thinkagile.co.za/agile-for-kids/>
- Fig. P (p. 67), *To do, Doing, Done*. Available at: <https://thinkagile.co.za/agile-for-kids/>
- Fig. Q (p. 67), *Kanban Board*. Available at: <https://thinkagile.co.za/agile-for-kids/>

# RINGRAZIAMENTI

*Desidero innanzitutto ringraziare il mio relatore Alessandro Confetti, il quale è stato in grado sin dai primi incontri, di cogliere l'essenza di ciò che desideravo approfondire e di guidarmi con pazienza, interesse e dedizione nel mio percorso di ricerca.*

*Un immenso grazie ai miei genitori, perchè nonostante le difficoltà di questi cinque anni, mi hanno supportato (e sopportato) con tutte le loro forze, permettendomi di raggiungere i miei obiettivi.*

*Grazie alle mie sorelline Elisa e Chiara che sono sempre con me e alle quali ho dedicato con il cuore queste pagine, con l'augurio di trovare il proprio luogo e spazio nel mondo nel quale poter esprimere sè stesse, coltivare le proprie passioni ed essere serene.*

*Grazie ai miei adorati nonnini Maria e Milo per la loro compagnia, per il loro affetto smisurato e per la loro giovinezza!*

*Grazie a Fabrizio, perchè se non fosse sempre arrivato in ritardo di due ore a prendermi a casa non avrei mai avuto abbastanza tempo per concludere la tesi. Grazie per avermi insegnato che la diversità è un valore aggiunto e che se ce ne prendiamo cura apprezzando la bellezza dell'altro, può solo aiutarci ad essere migliori.*

*Grazie a Silvia e Marti, grazie a Francesca sempre vicina anche quando è lontana, grazie a tutte le mie amiche ed amici con i quali ho condiviso spritz, pizze, caffè e risate. Grazie per avermi ascoltato, distratto, divertito e per avermi fatta sempre sentire a casa e mai sola.*

*Infine ringrazio tutte le persone che con entusiasmo e passione mi hanno raccontato la loro storia, coloro che hanno dedicato parte del loro tempo a rispondere alle mie domande e a condividere con me le loro esperienze. Un ringraziamento particolare lo dedico a Valeria Della Rosa, a Cristina e ai suoi fantastici piccoli alunni, a Eironwy de Mallet Morgan, a Jan Holland e a Sarah Ables. Grazie per aver contribuito attivamente e per avermi regalato la preziosa opportunità di poter guardare attraverso gli occhi degli utenti e di comprendere il senso e l'unicità della mia incredibile professione.*