

2023

**SOFIA TELES
NUNES G. PENAS**

**DEVELOPING CHILDREN'S SOFT SKILLS
THROUGH A DESIGN THINKING
INTERVENTION**

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Dissertação apresentada ao IADE - Faculdade de Design, Tecnologia e Comunicação da Universidade Europeia, para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Design Management realizada sob a orientação científica do Doutor João Batalheiro Ferreira, professor auxiliar e investigador da Universidade Europeia.

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palavras-chave

Competências; crianças; desenvolvimento; mercado de trabalho; escola; professor; educação

resumo

As empresas e organizações estão em constante mudança e adaptação de forma a manter a sua competitividade. Isto acontece enquanto novas gerações entram no mercado de trabalho. Investigadores realizaram estudos com gerentes e recrutadores de várias empresas que apontam para a falta de soft skill em gerações mais jovens. Este tópico tem ganho relevância dado que as soft skills são essenciais para o desenvolvimento pessoal e profissional de qualquer indivíduo.

Esta investigação tem como objetivo evidenciar a eficácia de uma intervenção de design thinking em contexto escolar, no desenvolvimento de soft skills em crianças. Utilizar-se-ão métodos qualitativos – observações diretas durante a intervenção – e quantitativos – através do preenchimento de um questionário antes e depois da intervenção. Os participantes estão no 5º ano, e têm idades entre os nove e os onze anos. As soft skills avaliadas são: trabalho de equipa, empatia, comunicação, pensamento sistémico, criatividade e resolução de problemas, liderança e pensamento crítico.

Este estudo confirma a possibilidade do design thinking funcionar como promotor do desenvolvimento de soft skills em crianças, contribuindo assim para as áreas da educação e desenvolvimento.

Posto isto, a integração do design thinking no programa escolar básico, as soft skills necessárias para o desenvolvimento pessoal e profissional seriam desenvolvidas.

Keywords

Soft skills; children, development, labor market; schools; teacher; education

Abstract

Companies and organizations are in constant evolution and adaptation in order to maintain their competitiveness. This happens while younger generations enter the labor market. Few researchers conducted studies among managers and recruiters, and the lack of soft skills in young people has gained special attention once it plays a crucial role in the personal and professional development of an individual.

By using qualitative – direct observation during the intervention – and quantitative – surveys applied before and after the process – methods, this investigation aims to provide evidence of the effectiveness of a design thinking intervention, in school context, as a promoter of soft skills in children. The participants were in the 5th grade, aged between nine and eleven years old. The present investigation evaluates how teamwork, empathy, communication, systemic thinking, creativity, and problem solving, leadership and critical thinking evolved.

The results confirm design thinking intervention as a soft skill promoter in children, contributing to the area of education and development.

This suggests that through the integration of design thinking in basic school's curriculum, the soft skills required for personal and professional lives are developed and may contribute to youngsters' future achievements.

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1 CHAPTER I – INTRODUCTION

This thesis explores the soft skills development in children. This topic has gained relevance from the mid-1990s, according to Bruce Tulgan (2015), and became more relevant with the newest generations, especially when they enter the labor market. The recruiters' and managers' expectations are not aligned with the ones of the younger employees. As so, it is important to reflect on when these younger employees should acquire the wanted soft skills.

1.1 Motivation and problem statement

Working as a monitor in a summer camp for two years allowed me to observe behaviors in certain situations and understand the lack of basic competences in children. The camp encompasses children from seven to fourteen years old, encompassing ten groups of children, where the only criterion is their age. At early ages, there is much more dependence from the monitor, as expected, sometimes even for basic care. According to Erikson's psychosocial stages (Table. 1), at this age, children begin to be independent and try new things, however, they need constant approval from a guiding figure (McLeod, 2023), that is the reason why they see their monitor as the problem solver; they explain the situation and let the monitor act. When the solution is not the expected one, in general, they express their disagreement, although when explained the reason for the presented solution, they accept and understand. In early ages, children interpret and apply the given information to different circumstances by changing and adapting their behavior (Berk, 2015). They get excited with every activity on the plan, and the majority is willing to try new things; they rate the activity during or afterwards, expressing their preferences. Younger children often play with children outside their group, in opposition to older children who tend to form close circles. Sometimes it is difficult to get them related to other people, out of their groups. They have a more defined personality (McLeod, 2023). These children are curious, although they do not always express their ideas, opinions, or preferences. In older children, conflicts are more frequent, both verbal and/ or physical, very often because they do not know how to manage their own emotions (Denham & Liverette, 2019). This is related to social cognition skills in adolescence. If not well practiced or developed, might lead to an improper choice of strategy for the situation (Ahmed et al., 2015).

Stage	Basic Conflict	Virtue	Description
Infancy (0-1 year)	Trust vs. Mistrust	Hope	Trust (or mistrusted) that basic needs, such as nourishment and affection, will be met
Early childhood (1-3 years)	Autonomy vs. shame/ doubt	Will	Develop a sense of independence in many tasks
Play age (3-6 years)	Initiative vs. guilt	Purpose	Take initiative on some activities – may be develop guilt when unsuccessful or boundaries overstepped
School age (7-11 years)	Industry vs. inferiority	Competence	Develop self-confidence in abilities when competent or sense of inferiority when not
Adolescence (12-18 years)	Identity vs. confusion	Fidelity	Experiment with and develop identity and roles
Early adulthood (19-29 years)	Intimacy vs. isolation	Love	Establish intimacy and relationships with others
Middle age (30-64 years)	Generativity vs. stagnation	Wisdom	Contribute to society and be part of a family
Old age (65 onward)	Integrity vs. despair		Access and make sense of life and meaning of contributions

Table. 1. Erikson’s psychosocial stages, adapted from <https://www.simplypsychology.org/erik-erikson.html>

Comparing young children with early adolescents, in early ages there is more acceptance, empathy, and communication; it is easier for younger children to make friends, to relate to each other and to communicate. Older children often feel frustrated if they do not perform a certain activity with their chosen friends, and sometimes, they do not know how to deal with unknown situations.

In Portugal, children from 5th and 6th grade spend around 8.214 hours in classroom per year, more than the rest of the children in Europe (Guedes, 2019). This time is essentially focused on content transmission, while there is an increasing technology literacy gap between teachers and students (McCrindle, 2021), revealing the need for new teaching approaches. Romero (2017) defends this idea prompting that society should be adaptable to new challenges, otherwise, “we will become

dinosaurs” (Romero, 2017, p. 3). Learning by doing is an approach that can be adopted by teachers to transmit the basics of soft skills (Chakraborty, 2022).

Design thinking fits this definition once it can explore new possibilities through the exploration of everybody capacities often neglected (Brown, 2009). Nunes et al. (2021), state that it can be a valuable tool for children and adolescent empowerment by stimulating empathy, communication, creativity, and the ability to analyze and solve problems.

That said, children need a way to develop soft skills in order to become personally and professionally successful.

1.2 Research question

According to this framework, the research question was stated as: Can a design thinking intervention in the second-cycle of school promote the development of soft skills in children?

1.3 Research methodology and document structure

The study aims to clarify if softs skills can be developed in children through a design thinking intervention. This method was inspired by the study of Carrol et al. (2010), who brought design thinking to classrooms.

It is an investigation through design which presents a multidisciplinary nature, relating three major acting fields – soft skills, design education, and the learning process. These concepts will be explored in Chapter II.

This introduction aims to clarify and define the problem. In the literature review the three major concepts are clarified. This chapter is divided in three sub-chapters – the first one presents the importance of soft skills in different contexts as well as their relevance in today’s society, according to different generations; the following sub-chapter is about education, encompassing the benefits and challenges of design education, as well as the presentation of the methodologies of design thinking; and the final sub-chapter is related to learning processes, exploring different theories and techniques, along with learning promoters.

The methodology follows the literature review, explaining how this study was conducted, the results that were collected during the intervention, and their analysis. Consequently, in the final two chapters, the intervention and control groups were compared, and conclusions were drawn. Suggestions for future research were also presented.

Figure 1 illustrates the research design; After defining the theme, title and research question, certain goals were established in order to guide the tasks. Starting with the literature review, problem contextualization, and identifying both the soft skills, the ones required for managers and recruiters, and the ones related with design thinking; after, the survey will be constructed. This study encompasses an intervention that was planned according to the children's age. After the surveys are once again applied, the results will be analyzed. Conclusions were drawn and suggestions for future research were made.

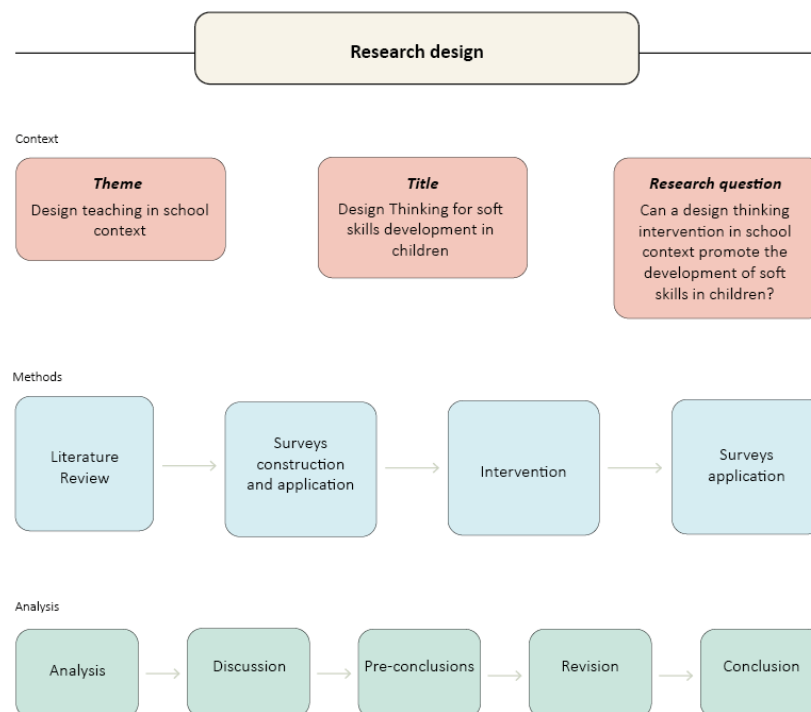


Figure 1, Research diagram

2 CHAPTER II – LITERATURE REVIEW

2.1 Soft skills

2.1.1 Soft skills definition

This concept emerged as the opposite of hard skills - technical skills, easy to evaluate in a short period (Dean & East, 2019) and specific for a certain task or role, for example, to have an academic formation in a determined area. According to Robles (2012), they are the technical expertise and knowledge needed for a job (p. 453).

The term “soft skills” has been studied in several fields - psychology, education, or even organizational theory - and became more relevant in recent years. There is a wide spectrum of applications of the concept, even though there is no agreement on an exact definition. Soft skills are non-technical skills, and include abilities such as critical thinking, problem-solving, leadership and responsibility, communication, and collaboration (Devedzic et al., 2018).

Heckman and Kautz (2012) define them as personality traits¹, goals, motivations, and preferences that are valued in the labor market, in school, and in many other domains (p. 451). Rodrigues (2021) follows the same idea, associating soft skills with personality traits, which can be defined as: “Personality traits are the relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances.” (Roberts, 2009, p. 7).

In Robles (2012) perspective, soft skills are the result of interpersonal skills, associated with people skills, combined with personal attributes, related to career aspects. They are about character traits, attitudes, and behaviors, and therefore, intangible. Bruce Tulgan (2015) complements this idea since he characterizes them as hard to measure or evaluate due to their intangible nature when compared to hard skills, however, psychologists and social scientists continue to try to find the most accurate way to measure them.

¹ Personality traits are better understood according to the The Big Five Model; Big Five is a taxonomy of five higher-order personality traits that are believed to be responsible for people’s differences and is considered the world’s most researched and used personality construct to date (Kabigting, 2021, p. 82). The five dimensions are Openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Kabigting, 2021).

Rodrigues (2021) argues that soft skills are life success predictors, however, measuring or quantifying them depends on many factors. Psychologists try to overcome this obstacle by associating intuitive names to traits, so people can respond to questionnaires.

The author suggests that these traits are measured by observing the person's performance in a determined task or set of tasks. Although it is important to refer that performance outputs depend on the effort applied, cognitive ability, personality traits, and other acquired skills. Personality traits manifest themselves through feelings, thoughts, and behaviors. The last variable, “behaviors”, is strongly connected with traits, and depends on the created situation (Fig. 2).

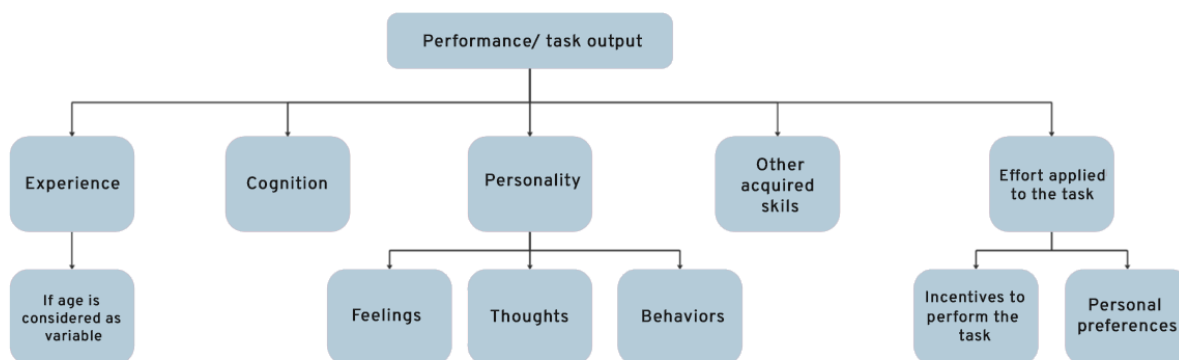


Figure 2, influencers of performance adapt from Rodrigues (2021)

Even so, it was observed that in a wide range of tasks, there is a pattern in people’s behavior, (Epstein, 1979), suggesting a basis for the existence of stable traits; heritability studies demonstrate that 40% to 60% of them are heritable (Bouchard Jr. & Loehlin, 2001). This does not mean that traits are immutable, some change over life. What is not clear is why personality traits change, by natural causes like ageing - ontogenic change – Agreeableness and Conscientiousness tend to grow with age; or due to environmental changes typical of growth and entitled as sociogenic change. As such, and considering all the variables, by performing a task, it is possible to infer about traits (Rodrigues, 2021). Under this view, personality traits and therefore soft skills can change and improve according to the range of situations or tasks which people experience. They can be developed based on practice and habituation, although it is also important to refer that previous skills and knowledge influence the acquisition of new skills. Ana Paula Freitas and Rita Almendra (2021) suggest a conceptual map that classifies and relates different soft skills. Their survey presents the idea of gateway skills – *previous skills that are*

needed for the development of high-order skills (p. 5). The authors suggest two major categories for them: interpersonal/ social, skills which depend on social and relationship knowledge; and cognitive/meta-cognitive, skills which require a cognitive process and reflection. The first group was identified as gateway skills, participation, and collaboration, in order to develop teamwork, leadership, communication, empathy, and entrepreneurship; all these skills are developed collectively. In the second category, curiosity, research and exploration, flexibility, open-mindedness, and ethics and commitment are the gateway skills necessary to improve creativity which influences problem-solving, and in its turn, affects systematic thinking; self-management, motivating the ability to 'learn to learn', and judgment shaping the decision-making skill. Excluding open-mindedness, all skills can be developed individually (Freitas & Almendra, 2021). Chakraborty (2022) refers to three different ways to look at soft skills, saying that this concept can be interpreted as people skills, non-cognitive skills, or even emotional intelligence. The non-cognitive characterization excludes the application of IQ-test as measurement. This means that IQ tests measure parameters that are not related to this concept (Amdurer et al., 2014; Rodrigues, 2021).

Skills are also commonly associated with “competence” (Amdurer et al., 2014; Harvard, n.d.; Marrelli et al., 2005; Rodrigues, 2021). The concept emerged with the publication of David McClelland - Testing competence rather than intelligence – a psychologist expert in human motivation who conducted researches for over thirty years in Harvard and developed a model of human motivation, where he encompasses three dominant needs: for achievement, for power, and for affiliation (Harvard, n.d.). In his studies, David McClelland discovered that people are differentiated by their performances' results instead of their skills (Rodrigues, 2021).

Amdurer (2014) organizes competences in three dimensions – cognitive intelligence, connected with pattern recognition and system thinking; emotional intelligence, which embraces competencies such as achievement orientation, emotional self-control, self-confidence, emotional self-awareness adaptability, positive outlook, and initiative; and social intelligence, related with empathy, organizational awareness, inspirational leadership, influence, coaching and mentoring, conflict management and teamwork (Amdurer et al., 2014, p. 3). In his turn, Bartram (2011) claims the significant difference between competence and competencies. Competence relates to performance or outcomes; competencies relate to the behaviors underpinning successful

performance (p. 4). Summarizing, competence is demonstrated by applying competencies (Bartram, 2011, p. 5).

Let us clarify the difference between competence and skill. The European Commission (2017) states that competence is the proven ability to use knowledge, skills and personal, social, and/or methodological abilities, in work or study situations, and in professional and personal development [while] skills are related with the ability to apply knowledge and use know-how to complete tasks and solve problems. “Skills are described as cognitive (involving the use of logical, intuitive, and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools, and instruments)”, (European Commission, 2017, p. 18).

Mário Ceitil, a portuguese author who researches and teaches in the domains of organizational psychology and human resources, published a book entitled “Gestão e desenvolvimento de competências” [Skills development and management] where he states that the definitions applied to the concept of skill can be grouped in four categories – attributions, qualifications, personal characteristics, and behaviors or actions. The first category is characterized as extrinsic factors that are related to advantages for specific positions and/or functions. If the definition of the concept integrates the qualification group, it means that “skill” refers to a set of knowledge and technical skills acquired through formal education. Personal characteristics are related to performance outcomes and behaviors. Finally, the behaviors or action category, it means that it is about a person's ability and potential to successfully perform a certain task (Ceitil, 2016 cited by (Rodrigues, 2021).

Even though there are plenty of definitions for the concept of soft skill, and also different perspectives and approaches, most authors agree that they have major importance in the development of a person as an individual and it can affect their success in their life (Amdurer et al., 2014; Chakraborty, 2022; Heckman & Kautz, 2012; Jardim et al., 2022; Noel & Liub, 2017; Rodrigues, 2021; Tulgan, 2015). For this dissertation, it will be consider Freitas and Almendra’s definition of soft skill - interpersonal, social, and emotional competencies, applicable to different fields and seen as differentiators in contemporary society (Freitas and Almendra, 2021).

2.1.2 Generation Z: the last workforce

The macroeconomic reality we live in is making the world fast, agile, and volatile, which requires that companies must be quick and adaptable in order to increase competitiveness. Employees make the organization and are the greatest influence on its performance (Gao et al., 2019; Wu et al., 2013), so the more aligned with the purpose of the company, the easier it becomes to obtain the pretended performance outcomes, distinctive marks of successful organizations (Rodrigues, 2021). Generation Z or Millennials were born between 1990 to 1999, and they represent more than 20% of today's workforce. They were the first generation to grow in a digital technology environment - the Information Era, influencing the way they think, act, and communicate (Arora et al., 2019; Castells, 1996; Tulgan, 2015). Castell (1996), declares that social structures, organized around networks, are dominating human activity. The same author defines networks as open structures capable of expanding without limits, which are susceptible to innovation and promote globalization.

Bruce Tulgan (2015) corroborates the previous statement, affirming that this generation is influenced by historical forces such as globalization, technological development, institutional insecurity, the information environment, human diversity, virtual reality, and helicopter parenting. Globalization provides this generation the opportunity or the challenge to compete with the whole world since there are almost no geographical barriers; technology contributes to the quick changes of the world and by being present in every single aspect of their lives – commerce, food, communication, entertainment, health, information, education, among many others – makes opportunities come and go very drastically. Gen Zers also grow up in an unstable world: they were children when the 11 September happened, teenagers when the economy collapsed, young adults when all kind of conflicts erupted, and living a whole lifetime with a climate crisis warning; for them, solutions do not come from an institution, and therefore they do not trust them enough to consider it an influencer of their success and security.

Zers are also the first digital natives, (Tulgan, 2015) – primarily younger people who grew up with the internet and are more comfortable using it in their everyday life (Dutton & Blank, 2014, p. 55) – they are experiencing a never-ending information space, being constantly bombarded with perspectives, new ideas, personalities, sounds, images, and infinite content. Their parents

also have an important role in the construction of this generation's personality and values – parenthood comes at a later age than the previous generation, drastically changing the environment where children grow. Today's parents are so involved and concerned about supervising and supporting their kids, making sure that they have all the possible advantages to face the real world that sometimes they forget that the real world can be harder than they made it look. Lukianoff and Haidt (2018), in their book, refer to a common conclusion retrieved from several studies - modern parenting is preventing kids from growing strong and independent (Lukianoff & Haidt, 2018, p. 157). The authors underline the pressure that society puts on parents, often leading them to be overprotective, and children to have an extremely restricted childhood. This situation might conduce to serious consequences, such as mental health issues and a lack of resilience (Lukianoff & Haidt, 2018). Even education has suffered changes, Generation Z is the most home-schooled, and even in public schools, parents are over-integrated into the system.

In conclusion, Gen zers and Millenials have grown up being considered a user of a service provided by an authority figure and when something misses, that figure ensures they get back on track (Tulgan, 2015).

Tulgan studies' underline that it is harder for children to develop their soft skills due to overprotection and the lack of being put outside their comfort zone even when managers and recruiters are giving soft skills a significant role and recruiting with this concept in mind. Soft skills are more valuable just at the moment they are growing scarcer.

Perception about work

Organizations are in constant evolution and adaptation. The world forces them to do it, in order to become competitive and innovative. However, each company decides how they can achieve their goals and objectives, based on available resources.

The Pandemic has changed the world, and consequently, it changed the perspective on how to work. People now understand that their time and freedom are something that they are not ready to give up. Flexible working hours, that emerge with the remote work model – based on Prasad (2020) findings, is about challenging the preconceived idea that people must work in a particular

location— allow people to create their own schedule. It also complements the idea that there is no need to be attached to a specific desk and computer to be as much, or even more productive. As such, the perception of work has changed, especially for the current workforce, Generation Z (Tulgan, 2015) - when it comes to getting a job. The Fast Company (2022), a magazine published by Alan Webber and Bill Taylor, former editors from Harvard Business Review, talked with seven Gen-Z founders of their own start-ups, to understand what this generation values in their workplace. In their report, they pointed out six main values: prioritizing mental health, putting values before growth, avoiding hierarchies, flexibility, autonomy, and accommodating all generations.

Mental health is one of the most common reasons why Gen-Zers leave their jobs. From the point of view of Kelly Greenwood and Julie Anas (2021). 81% of Gen Zers left their jobs due to mental health issues, this percentage increased 6% since 2019. For the mentioned authors, mental health has become a must in every business. Their values and the values of their brands and companies are extremely important and can be related to brand loyalty (Fast Company, 2022), and the trend suggested by Euromonitor's "Young as disrupted". This trend points out that 48% of Gen Z consumers want to engage with brands to influence the final product, and 30% of these consumers buy based on brands' social and political beliefs (Euromonitor, 2023).

In conclusion, Gen Zers pay close attention to the companies they are working for, making sure the company is aligned with their personal values and beliefs. In their turn, by avoiding hierarchies, they guarantee the most effective communication and improve team spirit. Flexibility is about the possibility of remote work or a hybrid model, which, in their perspective, increases the sense of belonging and it also improves communication. Autonomy deals with productivity; working on a stipulated schedule is getting left behind. They believe that forcing an employee to be productive for a fixed time is not the best way to get people motivated or productive, therefore, they are free to set their own schedule. Finally, accommodating all generations means that Generation Z is concerned about having the right environment for all ages and they also mention that a diversified team is important for the companies' growth (Fast Company, 2022). According to Deloitte (2022), this generation chose to work for a company based on learning and development opportunities (40%), opportunities to progress/grow in their career, a sense of meaning from work, a high salary or other financial benefits, and good work/life balance. In their

turn, when asked about the motives that made them leave, they refer to low payment (21%), feeling that the job was affecting their mental health, not feeling needed or valued, burnout, or their role was eliminated. This generation is different from the previous ones, and their perception about work is not an exception. The correct understanding of them can simplify the recruitment process and retain talent in organizations (Arora et al., 2019).

That said, work no longer has a directly proportional relationship between working hours and salary at the end of the month. Therefore, finding a work that fits one's personality can be a more difficult task, since this generation considers many more factors than previous ones. However, it is important to consider that most people do not run their own company, which means this generation is experiencing recruitment, and dealing with employers and managers as well.

Missing soft skills

For Bruce Tulgan (2015), this generation's workforce is one of the most complete - they come with new ideas, perspectives, and technical skills, but with a great lack of soft skills, affecting the workplace environment and consequently, business outcomes. When managers were interviewed, they mostly pointed the unprofessionalism, lack of self-awareness and responsibility, incorrect attitudes, and work habits – managers say that they spend a lot of time on their devices and sometimes they cannot even get to work on time - not focusing on their work, problems in deferring authority, terrible people skills and needing of constant approval. By analyzing these inputs, he discovered that what was missing for this generation's workforce was the old-fashioned basics – professionalism, critical thinking, and followership.

The first one – professionalism – is related to self-evaluation, of thoughts, actions, performance, goals, orientation, and parameters; personal responsibility, maintaining focus and controlling themselves; work habits, associated with presentation, punctuality, organization, productivity, and initiative; people skills, knowing how to listen, observe, read, do a correct use of words, tone, expressions, and body language, understanding and empathizing, presential or distance; and a positive attitude, assuring a good work environment. Bruce Tulgan (2015) relates that the first job is often embraced by young adults, however, there is a clear lack of discipline and consistency. It is caused by their proximity to parents, making them feel they will always be supported, the lack

of adaptability to a workplace where rules are already defined, and their deficient communication skills caused by technology.

Critical thinking is also a major old-fashioned basic pointed out by Tulgan. He associates it with citizenship, prizing rewards, but also, embracing duties; teamwork, coordinating, cooperating, and collaborating with a team who works towards a goal and recognizing the success of the other; and respecting the context by adapting to existing structures, rules and leadership; and service, establish relationships based in what there is to offer instead of what is needed. What happens is that they seem to be experts in shallow analysis due to the infinite information available, the result is that they do not understand the results achieved, and they don't have time to reflect. To summarize, even if they have access to much more information than the previous generation, they do not know how to interpret and evaluate it.

Followership is linked with pro-active learning by keeping an open mind, not judging and questioning assumptions in order to create a knowledge base of abilities and wisdom; problem-resolution by adapting previously known solutions to a different existing problem, ensuring efficiency; and decision-making, identifying and considering options, evaluating them, and choosing the one who is more related with the expected outcomes. The gap appears because they are used to think like customers, they are grateful for having an income source and several benefits, however, they are not willing to make sacrifices for a greater good. They are not also used to interact with people from different ages, so they find it difficult to adapt to a new range of people. The dependency caused by having their parents one phone call away makes them expect those grown-up work colleagues to be there to take care of them. Also, they do not expect to create roots in the first company they work for, so what is the point of trying so hard if they are not planning to stay for a long period? (Tulgan, 2015).

2.1.3 Managers and recruiters: wanted soft skills

Career Build (2011) claims that managers are exposed to higher levels of stress due to the demands of the economy and smaller staffs, therefore, they prioritize emotional intelligence over IQ. They claim that employees with bigger levels of emotional intelligence have the ability to deal with pressure, are more able to conflict resolution, tend to take more conscious decisions, and can be more empathic to team members. Dean and East (2019), defend that emotional

intelligence is related to the capability of identifying feelings, managing them, and using that information to appropriate future behaviors.

Wahl et al. (2012) conducted a survey where a total of 185 jobs were considered. They found out that the most wanted skills are self-motivation, team integration, communication, and project management skills. The first one is related to responsibility, willing to help others, and being enthusiastic; team integration is about achieving results and objectives in a group, while communication is composed of oral and written abilities that guarantee efficiency in idea and fact transmission, as well as preparing and conducting presentations or providing customer services. The labor market also values adaptability – people who can deal with changing situations.

A positive spirit is also mentioned once it can influence team members (Bailly & Léné, 2013; Gao et al., 2019). Rodrigues (2021), defends that people who can understand and solve problems and have a set of differentiator behaviors and attitudes are valorized in the recruiter's viewpoint. Shuyato (2013) orders by importance the most wanted skill by managers - *responsibility and accountability, interpersonal skills, oral communication, teamwork, ethical values, decision-making and analytical skills, and creativity and critical thinking* (p. 101). Empathy is, in its turn, seen as a transversal skill to several working fields; Noel and Liub (2017) focus on health care, physicians, retail, education, and management. Hirsch highlights teamwork, communication, leadership, problem-solving, initiative, and self-regulation are also cited as advantageous for a variety of jobs, while Marcel Robles (2012) identifies the top 10 skills in the business industry: integrity, courtesy, communication, social skills, responsibility, flexibility, positive attitude, work ethic, teamwork, and professionalism. Succi and Canovi (2020) suggested that employers give prior importance to people who are professionally ethical, who can adapt to change, who are creative and innovative, who have customer or user orientation, and who work in a team.

These results suggest that the labor market is evolving, and so, the employee skill set must evolve too. Resuming the previous studies, managers and recruiters are seeking for people who can work in a team, achieving objectives together (1); who have strong communication skills, oral and written (2); who are responsible and can easily adapt to different situations, revealing flexibility (3); have work ethic and can be professional (4); who are emphatic, understanding and

considering different perspectives and viewpoints (5); people with critical thinking (6) and problem-solving abilities (7); and who have a leadership skill (8). These skills will be briefly defined.

(1). Teamwork, can be interpreted as the ability to work with a group, sharing knowledge, perspectives, behaviors, and motivation in order to guarantee competitive advantage (Nadal et al., 2015). To European Commission (2017), it is about working with others, integrating a team, and sharing competences and social skills. According to Robles (2012), teamwork is related to aspects such as cooperation, agreeableness, support, collaboration, helpfulness, and establishing relationships with others. For Fernandez (2008), it consists in the interaction of two or more members who share inputs – knowledge, skills, abilities, resources, and demands – so they can coordinate themselves and plan the actions needed, in order to achieve a mutual goal. Salas (2000) characterizes it as a multi-dimensional and dynamic activity that depends on behaviors, feedback, communication, context, coordination, and effective leadership.

(2) Communication is the ability to convey thoughts, opinions, and information to others. This can include speech, writing, or signs (Brill et al., 2014, p. 176). According to Robles (2012) Freitas and Almendra (2021) it is classified as a people-related skill and includes expressing ideas clearly and objectively through write and oral means as well as presenting and listening skills. Laar and Deursen (2020) presents a significant variable – the audience – communication style must be adapted to it, so ideas are correctly transmitted. It is also needed for most interpersonal situations or jobs, and writing is a great way to test it (McClelland, 1973). It sets a basis for the development of other competencies needed in the workplace and it is related to professional success (Waldeck et al., 2012).

(3) Flexibility is about changing the initial approach according to a perspective, situation, or problem (Kaya F. cited by Freitas & Almendra, 2021), while Robles (2012) refers to the acceptance of new things. (4) Work ethic and professionalism are related to self-discipline, hard work, motivation, and initiative (Robles, 2012); it is about work habits, attitudes, and behaviors in the workplace. According to Succi and Canovi (2020), *professional ethics is to act while bearing in mind the principles and ethics of the profession in daily activities* (p. 1836).

(5) Empathy is, as settled before, a skill that is transversal to different jobs, independently of expertise (Noel & Liub, 2017). It is related to *taking the role of the other person and imagining the situation from his or her perspective [leading] to self-reflection, when, upon considering a wide range of opinions and beliefs, individuals recognize that what they take for granted in a situation is not necessarily shared by others* (OECD, 2005, p. 12)

Another perspective is defended by the European Commission (2017), which defines empathy as the ability to understand verbal and nonverbal language and therefore, understand feelings. The Cambridge Dictionary's (2023) definition of the concept is in line with the previous authors, it is stated as the ability to understand other persons' feelings and interpret a certain situation from his/her perspective. In addition, Noel and Liub (2017), stress that empathy influences a person's success, personal and professional.

Consecutively, (6) critical thinking relates with question assumptions identifying misconceptions, and presenting systematic solutions (Robles, 2012). Richard and Elder (2007) define it as the process of analyzing and assessing thinking with a view to improving it. Critical thinking presupposes knowledge of the most basic structures in thinking (the elements of thought) and the most basic intellectual standards for thinking (universal intellectual standards). The key to the creative side of critical thinking (the actual improvement of thought) is in restructuring thinking as a result of analyzing and effectively assessing it (p. 6).

In turn, (7) problem-solving is described by Bahar and Maker (2015) as the combination of intellectual capacity and cognitive processes resulting in a high-order thinking process; the author also claims that certain competencies are associated with problem-solving: creativity, originality, spatial and verbal ability, working memory, and acquired knowledge. Problem-solving is also seen as an essential skill to interpret the involving world and society, consequently, it is used in different fields; the authors remarks business, politics, education, health, and social occupations (Gunawan et al., 2020).

Finally, (8) leadership skills, refers to patterns of behavior as well as attitudes about communication, conflict resolution, criticism, teamwork, decision-making, and delegation

(Trivellas & Drimoussis, 2013, p. 694). Robles (2012) attributes this skill to people who take initiative and responsibilities, are motivated, attribute tasks, and motivate team members. Another point of view characterizes it as the ability to influence others through actions or behaviors (Freitas & Almendra, 2021 citing Mumford M.D., Gujar Y, 2020). For Salas et al. (2000), leadership skill involves analyzing the mission and remaining aware of the progress of the team so that a current cognitive model of the problem facing the team can be constructed (p. 350).

Soft skills models in recruitment

Skills are nowadays a must of recruitment and play a crucial role in people management, (Rodrigues, 2021). Recruiters focus on hiring those whose prior experience suggests that they will succeed (Hirsch, 2017) trying to align skills with jobs' functions. Consequently, models have been developed in order to evaluate which skills are needed to perform a certain task or job (Rodrigues, 2021). As a result, they play a crucial role in the everyday life of an organization and it is usual that different companies have different models due to the specific nature of occupations inside organizations (Krumm et al., 2016). Bartram, in 2002, developed a model applicable to a great variety of jobs and companies – The Great Eight Model. It is suggested that the eight dimensions are related – Leading and deciding, Supporting and cooperating, Interacting and presenting, Analyzing and interpreting, Organizing and executing, Adapting and coping, Enterprising and performing, and Creating and conceptualizing (Bartram, 2011):

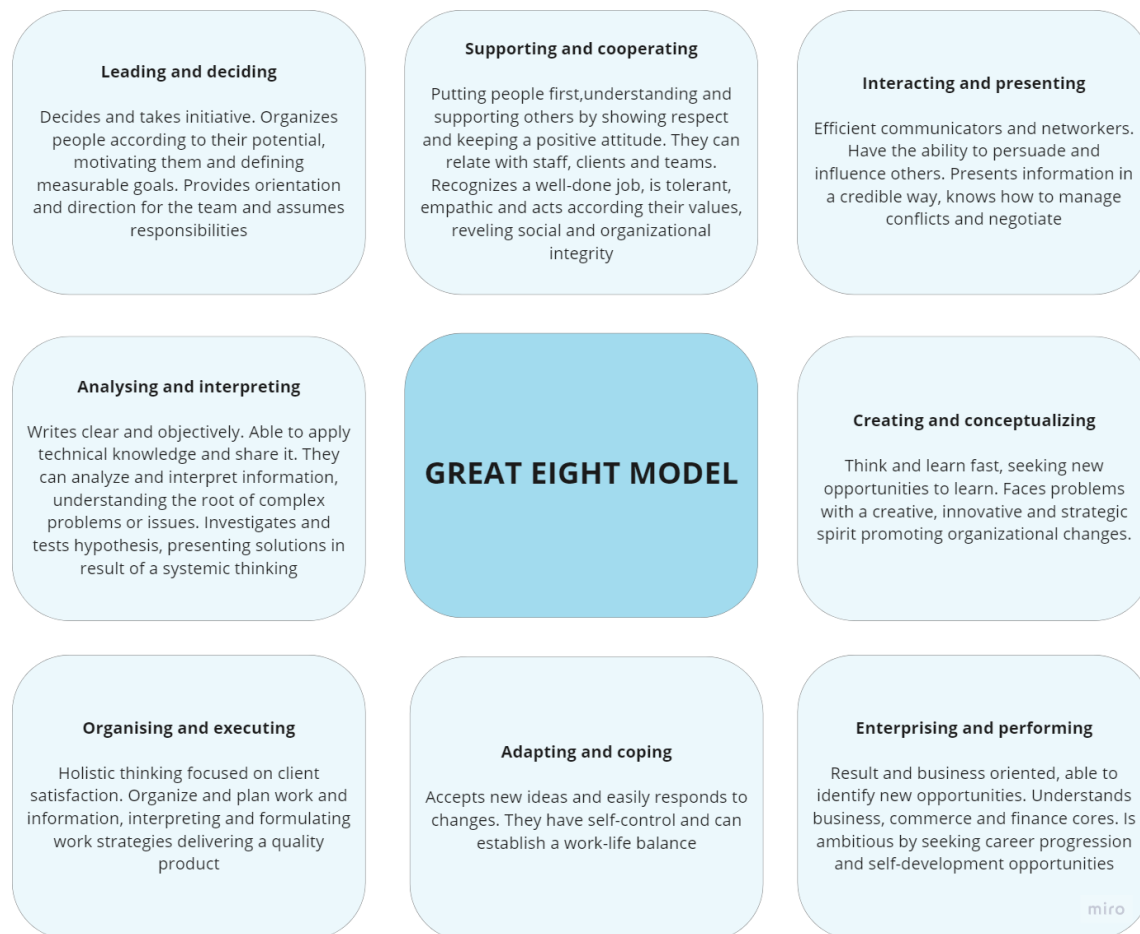


Figure 3, Great Eight Model adapt from (Bartram, 2011, p. 7; Rodrigues, 2021, p. 5)

This model is not fixed, and it is interpreted according to the nature of each organization.

Rodrigues (2021) tested the psychometric properties of the model, by developing a set of items to each of the eight dimensions presented by the Great Eight Model and draws the conclusion that it is a viable tool in recruitment activity. It is composed by 24 items, and it is an option to consider, considering the instruments currently in use in Portugal– CompTEA and BIS – with 172 and 220 questions, respectively. The new tool reduces stress and fatigue effects and saves time in the recruitment process.

Some of the employers' and recruiters' perspectives about the importance of soft skills were collected from the literature. When recruiting new employees, they expect them to be empathic and show integrity so team spirit can be promoted (Rodrigues, 2021). A clear vision of their own career is also highlighted (Dean & East, 2019). In his turn, Bruce Tulgan interviewed thousands of managers about the importance of soft skills and obtained a nearly universal answer: soft skills

matter. The cliché is that people are hired because of their hard skills but people are fired because of their soft skills (Tulgan, 2015, p. 31)

The importance of soft skills and how to develop them

Bruce Tulgan (2015), in his studies, discovered that the soft skills gap began to be tracked in the 1990s and reports that the gap is growing worse. In his studies, he discovered that there is a pattern that relates the younger generations with a greater lack of soft skills, particularly in the workplace.

The lack of soft skills can affect workers' behaviors, engagement, and productivity, therefore, it also conditions business outcomes (Dean & East, 2019). Tulgan (2015) stresses the influence in the workplace, misunderstandings happen, people get distracted, reduce productivity, mistakes are committed, customer service is affected, conflicts start to happen, and eventually good people leave.

The problem is that it is not possible to hire based only on soft skills, and the increase in business competition leaves no margin for developing them. Managers expect that employees bring the required soft skills by the time they get to the workplace, however, that is not a reality and cultivating them means spending time and resources. Bruce Tulgan (2015) claims that if soft skills were developed, generation Z would provide one of the most competitive backgrounds in history. Dean and East (2019) in their interviews found that managers consider that soft skills should be part of the college curriculum, ensuring that individual and group soft skills are developed.

2.1.4 The next generation: Alpha

The Alpha generation follows Gen Z, and therefore, is the 21st century's second generation (Ziatdinov & Cilliers, 2021), representing the future workforce. According to McCrindle (2021), they were born from 2010 to 2024 – the older ones witnessed the launch of the first iPad by Apple, and the creation of Instagram. The technology influence in the most aspects of their lives

is notable. They are now exposed to a world of information with easy access, and infinite types of content, however, interpreting it is essential (Ziatdinov & Cilliers, 2021). As expected, they are called “screenagers” since screens are used from a tender age, as pacifiers, for educational purposes and entertainment (McCrindle & Fell, 2020). The same author characterizes this generation as global, digital, social, mobile, and visual, and summarizes some aspects of their behaviors - app-based play, shorter attention spans, and digital literacy but less social formation (p. 6).

The development of soft skills at a tender age might be a changing point (Chakraborty, 2022), besides playing a significant role in employment, they also have extreme importance on children's development (Chakraborty, 2022, citing Tynan, 2015). Chakraborty (2022) and White (2017), affirm that there are skills that need to be developed as a child so they can be fully applied in a later stage of life: social skills, so children do understand how to interact with different kinds of people (manners are included); communication, by initiate and continue a dialogue, to be clear and objective; listening skills, who seems to be growing worse due to technology dependency; building rapport, by making friend and building a network; empathy, seeing an issue from another person perspective, understanding their feelings and behaviors; problem-solving; self-control; self-esteem and confidence.

There is a growing need to change and adapt teaching approaches in order to reach the new generation and make them prosper (Raja & Nagasubramani, 2018; Romero, 2017; Ziatdinov & Cilliers, 2021). Children learn by example and observation, so Chakraborty (2022) remarks that teaching soft skills is a major role of parents and teachers. The classroom should manifest a collaborative environment, promote critical thinking, and encourage co-creation (Steyn M, 2015, cited by Ziatdinov & Cilliers, 2021). These objectives could be accomplished through a learn-by-doing approach (Chakraborty, 2022; Romero, 2017)

Summarizing the previous studies, soft skills should be encouraged from an early age, ensuring children correct personal development, and in a later stage, making sure that they are able to apply them in a work context.

2.2 Design Education and Design Thinking

2.2.1 Design education: benefits and challenges

Since the work context is changing, and the mindset towards it, it is clear education must change too in order to prepare today's children for the future once we are moving to a knowledge age (Noel & Liub, 2017). According to Uhl-Bien et al. (2007), the knowledge era stands in need of continuous knowledge/learning acquisition opportunities based on creativity and adaptability, this way, it is possible to design innovative and meaningful services and products once the primary font of creation is the human mind (Gorey et al., 2018).

Noel and Liub (2017) argue that *design education could play a successful role in supporting traditional education models* (p. 1), leading to a greater engagement at school and a prosperous life as a result of design thinking principles – empathy, collaboration, iteration, prototyping, testing, and human-centeredness. The same author refers to a significant benefit of exposure to design education, the development of non-academic skills, which will greatly impact the children's development.

The Noel and Liub findings are consistent with Madeline Levine, a psychologist who acts as a clinical, educator, consultant, and author of two best-sellers, who presents seven essential coping skills for children's development: enthusiasm, resourcefulness, creativity, work ethic, self-control, self-esteem, and self-efficacy (Noel & Liub, 2017, p. 3). Enthusiastic children tend to be participative and willing to learn (American Library Association, 2011). Resourcefulness, according to Levine (2012), is related to thinking about “different ways to escape a specific situation considering available possibilities, analyzing and deciding on the most efficient” (p. 3); creativity promotes experimentation and encourages children to think about different ways to solve a problem; work ethics is attached to academic engagement; self-control is about constructing their own values and rules, and being true to them; self-control is about developing and internalizing one's own rules, and being directed by one's good choices; self-esteem is linked to better academic and social outputs; while self-efficacy is tied-up to the effort and commitment applied to a task based on the belief that they play the major role in their own success.

Levine (2012) also remarks on the importance of curiosity, affirming that asking the right questions promotes knowledge acquisition.

Paul Tough (2012), stresses different success indicators when compared to Levine, he highlights creativity, social intelligence, optimism and gratitude, grit, zest, and self-control. In his book *How children succeed: Grit, curiosity, and the hidden power of character*, the author also emphasizes the need for motivation, willpower, and conscientiousness as predictors of workplace success (Noel & Liub, 2017).

The indicators presented by both authors are stimulated by design education according to Noel and Liub (2017), besides, “(...) most designers would affirm that it would be beneficial to expose children to design education, because of the benefits of the signature pedagogies of design, such as problem-based learning, human-centered creativity and iterations of prototyping and testing.” (p. 1).

On the other hand, teaching design might be a complex task, once design’s action principles are based on different fields (Meyer & Norman, 2020). This view is supported by Papanek:

“The main trouble with design schools seems to be that they teach too much design and not enough about the social, economic, and political environment in which design takes place. It is impossible to teach anything in vacuo, least of all in a system as deeply involved with man’s basic need as we have seen design to be” (Papanek, 1973, p. 281)

Resuming the prior studies, design is a practical/discipline that acts on different areas; therefore, it requires understanding the fields it will act upon, besides the understanding of the design itself.

Ken Friedman (2019) and Meyer and Norman (2020) draw attention to the challenges faced by design education, suggesting four categories – performance, systemic, contextual, and global *challenges* (Meyer & Norman, 2020, pp. 15–16). Performance challenges are related to the actions taken by designers, systemic challenges are about considering the whole rather than a single part, contextual refers to the manipulation of the system where design acts, considering the context in which it is inserted, and finally, global challenges, where solutions must be design based on complex world goals such as climate changes, poverty, and inequality. To embrace these challenges designers must have a multidisciplinary skill set to create significant changes in

the real world (Friedman, 2019; Meyer & Norman, 2020). In order to it, Meyer and Norman propose a set of skills/ abilities that designers should be taught and equipped with (Table 2):

Skills/ Abilities	Subjects/ curriculum
Design methods	Human-Centered Design principles; Co-design, community-driven design, co-creation, and their variants; the role of designers in developing strategy and as managers, mentors, and facilitators;
Creativity	Individual and team;
Leadership	team composition and management; training followership and leadership;
Design research	Qualitative and quantitative methods;
Core business principles	Finances (income statements, balance sheets, and cash flow), data-driven, sales and marketing, operations, distribution, supply chain management, patents, intellectual property, business models, and presentation skills;
Academic research	Know how to apply other's knowledge, rigorous thinking, prototyping, big data, programming, and computational thinking;
Design communication	Thinking and sketching by making;
Experimental methods and statistics	Probability theory, variability understanding, measurement methods, statistical significance, analysis, and ethical concerns;
Ethics	Social responsibility, social and environmental issues, impact measurement, health, safety, respect for society's beliefs, origins, and policy. Consider profits and law basics;

The real world	World history, culture, human psychology, sociology, and anthropology; basic human factors and ergonomics and human interaction;
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Table 2, Subjects and skills for designers, adapted from (Meyer & Norman, 2020, p. 41)

The multidisciplinary knowledge needed for a successful design project involves a multidisciplinary team, or, in Lewick et al. (2020) perspective, an interdisciplinary team. They justify this statement by reefing that an interdisciplinary team will bring members with deep different technical knowledge resulting in a holistic approach instead of a conditioned point of view (Lewrick et al., 2018).

2.2.2 Design thinking in education

Design Thinking definition

After World War Two, design was part of different professions, such as architecture and engineering. Later, Rittle and Webber (1973) introduced the concept of *wicked problem* - societal problems that are ill-defined and therefore, do not have a correct or single solution, contrary to the problems in the science field who has defined solutions.

The term design thinking attracted more attention years later, when Peter G. Rowe, in 1987, published his book *Design Thinking* (Aflatoony & Wakkary, 2015). Although, authors such as Richard Buchanan, Bryan Lawson, Nigel Cross, and Donald Schon (Camacho, 2020, p. 35), and more recently Tim Brown with his book *Change by Design*, and Don Norman with the release of *The design of everyday things*, contributed significantly for its development.

Design thinking has no clear definition, as there are different perspectives according to its application (Brown, 2009; Pressman, 2019). Brown (2009) refers to context as the greater influencer of it and defines this variable as all the factors that influence a problem – social, environmental, historical, cultural, stakeholders, or even budget – therefore, an idea cannot be developed aside from its context. He says that design thinking is fundamentally an exploratory process; done right, it will invariably make unexpected discoveries along the way, and it would be foolish not to find out where they lead (Brown, 2009, p. 18). Nigel Cross (2010) characterizes

the activity of design thinking as “(...) an absorbing, demanding, sometimes obsessional activity.” (p. 5). In the book *Design Thinking - Business Innovation* it is defended that, “Design Thinking brings a holistic vision to innovation. It works with multidisciplinary teams that follow a process, understanding consumers, employees, and suppliers as they are in their context, co-creating solutions with experts, and prototyping in order to better understand their needs. A Design Thinking team will end up generating new solutions that tend to be innovative and quite unexpected.” (Silva et al., 2011, p. 7).

On the other hand, Aflatoony and Wakkary (2015) define it as “(...) a specific design practice that aims to foster innovation by elevating participants’ creative thinking abilities. It usually involves a problem-solving approach to solve complex problems and can be best achieved through collaborative and human-centered activities “(p. 2). Lewrick, Link, and Leifer (2018), explain that design thinking is an ambiguous process that requires mindset adaptation to a determined situation, considering human needs. It can be applied to all types of situations and problems.

Andrew Pressman (2019) characterizes design thinking as a “(...) creative process that is driven by specific problems and individuals yet transcends conventional or obvious solutions.” (p. 4). By last, McKinsey (2023) claims that “Design thinking is a systemic, intuitive, customer-focused problem-solving approach that organizations can use to respond to rapidly changing environments and to create maximum impact.” (p. 1). Brown (2009) adds that design thinking explores abilities that everyone owns, however, are neglected through conventional problem-solving approaches.

Summarizing the presented studies, design thinking can be a creative, systemic, and innovative approach to solving problems in different fields based on human needs.

Processes of design thinking

As indicated by Andrew Pressman (2019), the process of design thinking is customizable and characterized by iteration; it is composed by “blocks” that can be related, but can also be replaced, suppressed, or amplified (Fig. 4). The solutions generated by this process usually have a disruptive and innovative character.

The author declares that the design thinking process begins with *Information Gathering*, where empathy is highlighted and qualitative research methods, such as ethnography and interviews are carried out. Ethnography consists in observing and interacting with stakeholders, in their environment, revealing flaws, understanding motivations, and getting valuable insights that will support the problem analysis and the ideation process (Pressman, 2019), it can be managed through interviews, notes, photos, videos, conversations, or analyzing stakeholders (Brown, 2009). According to Clifford Geertz (1973), this research method allows to fully understand the root of the problem.

On the other hand, interviews are a form of connection and immersion into the problem. To perform a good interview, it is important to know how to listen, and at this point, empathy will help to discover the stakeholder's interests and motivations (Brown, 2009; Pressman, 2019). Tim Brown (2009) suggests three empathy levels, the first one where the stakeholder's experience is lived, a second one where it happens a cognitive understanding of the collected information, and finally a third level where information is processed by emotions, understanding pains and motivations.

Pressman (2019) observes that normally stakeholders have difficulty in articulating their needs, this way, design thinking aims to deliver more than a solution to a preconceived problem. Tim Brown corroborates this author's point of view by presenting a quote from Henry Ford, "If I'd asked my customers what they wanted, they'd have said 'a faster horse.'" (Brown, 2009 citing Ford, n.d.).

To find the right problem, the right questions have to be asked. If the framework is not defined, the solution can be limited. In this way, there is a need to analyze, organize and quantify the information so it can be visualized and interpreted. This characterizes the phase of problem analysis, where it is extremely important that the problem is interpreted, rejecting assumptions. In order to it, design thinking prioritizes a continuous evaluation of the problem, ensuring the most viable solution. Therefore, in this phase different perspectives are documented formulating new questions, areas that need extra research are identified, information is prioritized and filtered, and patterns and relations are established in order to reach the main problem (Pressman, 2019). The idea generation phase is characterized by divergent thinking, promoting innovation (Brown, 2009). It tries to find a significant and valuable solution to the problem previously identified and it is normally performed in a team context. To generate ideas, it is usual to use Brainstorm

(Brown, 2009; Pressman, 2019) – a technique developed by Alex Osbron in 1939. During brainstorming, ideas are not judged, quantity is prioritized over quality, and there is a possibility to combine ideas. The goal is to create the maximum number of solutions (Pressman, 2019). Tim Brown (2009) supports the previous author citing Linus Pauling, an American chemist, biochemist, peace activist author, and educator: “To have a good idea, you must first have lots of ideas” (p. 42).

Synthesis and modeling, as opposed to the previous phase, is characterized by convergent thinking, defined by Tim Brown as a practical way to decide among multiple options. The power of prototyping is valued once it connects the designer with the project, and its feedback is more accurate (Brown, 2009), “You can talk about how you might do something, but cogitating will only get you so far. Sometimes it takes building a prototype to have that Eureka moment,” (Pressman, 2019 citing Culpepper n.d).

Finally, critical evaluation allows design thinkers to reflect on the process, and through it, empower the project. It should be exposed to as many people as possible in order to improve and deliver the best and most valuable solution. Criticism provides the opportunity to improve specific aspects of the project, responding to a direct problem:

Conversations and critiques help design thinkers to personally reflect on the process. When you have to articulate an idea and respond to criticism you are forced to think through more aspects of an issue, and ideas tend to become more concrete. On the other hand, if you keep something locked inside your head without having a dialogue, the reflection phase is neglected as you charge forward, with the potential loss of opportunities and insights. (Pressman, 2019 citing Simon, 2016).

The ability to criticize the own work is also an important factor, “Self-criticism can efficiently inspire new ideas, infuse projects or solutions with special meaning, and help formulate cogent arguments in support of convictions and aspirations. Used properly as design tool” (Pressman, 2019 citing Mead, 1999).

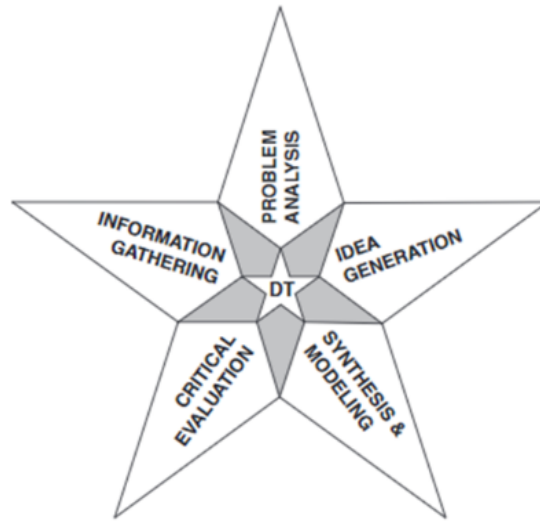


Figure 4, Design thinking process according to Andrew Pressman, retrieved from (Pressman, 2019, p. 6)

Tim Brown describes the process of design thinking as a space system – inspiration, where research motivation grows and therefore, information is collected; ideation, which means converting the previously collected insights into ideas and testing them; and finally, implementation, the project is implemented, and a specific action plan is developed. Similar to Pressman, also Tim Brown underlines the possibility of iteration by referring that it is possible to revisit spaces defined before. The first stage of the design thinking process is to discover and evaluate the project limitations according to their feasibility, viability, and desirability. The team must always consider this evaluation, reformulating if necessary. For the author, after ethnographic studies, the creative process relies on organizing, analyzing, and synthesizing, identifying patterns in order to create ideas. Synthesis and analysis play an important role in decision-making (Brown, 2009).

The author refers to prototyping as a crucial part of the process once it allows from an early stage to understand an idea's functionality and viability. There is no need for a perfectly functional model, the major goal is to make an idea tangible, understand strengths and weaknesses, and improve a final solution. Prototyping is related to visual thinking. When an idea is presented by a

draw, it is possible to create a stronger connection, this is why Post-it is a useful tool in design thinking, it encourages a quick materialization of an idea and improves decision-making (Brown, 2009). Design thinking greatest challenge is, therefore, to help people articulate their needs.

Models, teams and mindset

Design thinking process is often resumed by models such as Hasso Plattner and David Kelley Model, Design Council UK, Google Design Sprint, IDEO – Human Centered Design, Austin Center for Design, or even Design for America. Over the years, many other design thinking models were proposed, although the Double Diamond Model, or 4D Model, besides resuming the process, represents the type of thinking according to each phase. The Design Council (2019) refers to this model as universally accepted (Fig. 5):

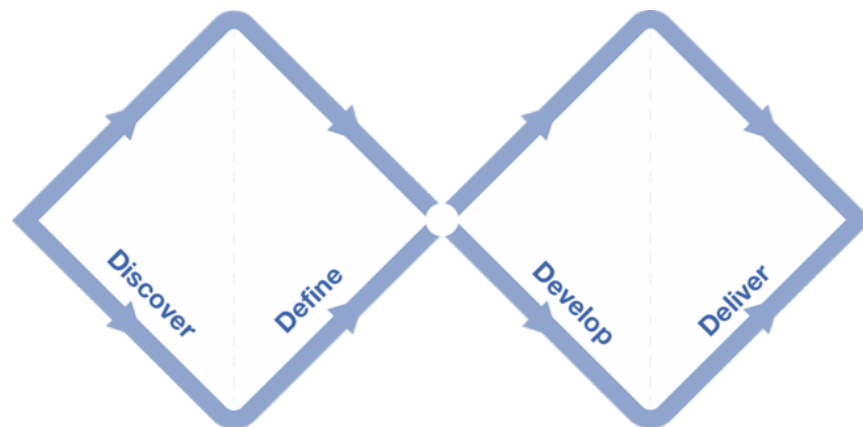


Figure 5, Double Diamond Model, retrieved from (<https://www.designcouncil.org.uk/our-work/skills-learning/the-double-diamond/>)

It is described as “a visual representation of the design and innovation process. It’s a simple way to describe the steps taken in any design and innovation project, irrespective of methods and tools used.”(Design Council, 2019). In the Discovery phase, research is conducted, and the user needs are identified, moving to the Define phase, the insights are analyzed, and the aim is to understand how the user needs are aligned with the problem; Develop refers to creating ideas, testing and improve possible solutions, and finally, the in the Delivery phase, a solution must be selected and

launched. The Discover and Develop stage are characterized by divergent thinking which, in Tim Brown perspective, is about creating multiple options [and gathering the needed information] increasing complexity – a necessary step for innovation. On the other hand, the “Define” and “Deliver” phases are driven by convergent thinking, where decisions are made, eliminating options. The same author refers to convergent thinking as a practical way to decide among multiple options (Brown, 2009).

Tim Brown defends his thinking definition citing Richard Nisbett – a psychologist – who suggests a “thinking geography”, declaring that after multiple inputs are analyzed, there is a tendency to converge toward a single option (Brown, 2009 citing Nisbett, 2003).

Design thinking has a specific mindset that may affect the project's success. According to Lewrick et al. (2018), a design thinker should be curious, asking questions to change perspectives and assumptions; should be focused on people, being empathic and careful in the process of needs exploration; accept complexity by embracing uncertainty and recognizing that complex problems demand complex solutions; visualize and show ideas clearly and simply by using simple language when sharing finding, so it is possible to create a value proposition; and finally, a design thinker should experiment and iterate constructing prototypes, understand, and learn from the users' context. In order to it, capabilities must be continuously expanded so opportunities can be found, different types of knowledge must be considered according to the needs of the project, the process of design thinking must be known, teams should work in a collaborative environment, and finally, a design thinker should be conscious of own assumptions (Lewrick et al., 2018). Razzouk and Shute (2012) point to different abilities, suggesting that a design thinker is characterized by their human and environment-centeredness, ability to visualize, predisposition toward multifunctionality, systemic vision, ability to use language as a tool, affinity for teamwork, avoiding the necessity of choice (p. 336). The authors explains each of these characteristics, human and environmental is related to always considering what is created and reviewing environmental interests; the ability to visualize is about working in a visual way; predisposition toward multifunctionality is linked to the different perspectives needed for the problem's framework, a designer should always consider the problem's “big picture”; systemic vision is connected to the creation of a holistic solution; the ability to use language as a tool is communication-related once it is characterized as the ability to verbally express their creative

process; the affinity for teamwork is linked to interpersonal skills who allows working with different people with different backgrounds; finally by avoiding the necessity of choosing a designer should be able to analyze before making a decision so innovation is promoted, this process prioritizes solution combination over a choice (Razzouk & Shute, 2012).

A good design team consists of people with different backgrounds and varying experience (Lewrick et al., 2020, p. 31). The members should possess technical and general knowledge in order to form an interdisciplinary team who encompasses several disciplines where ideas are collectively created, resulting in a sense of belonging to the project. This description corresponds to a T-shaped team – a concept developed by Dorothy Leonard-Barton. The horizontal bar of the “T” represents the breadth of knowledge, which embraces empathy and other characteristics such as open-mindedness and curiosity, about other people, other disciplines, and other environments – interests, culture, personality, dreams, and dislikes can be considered in a T-team profile. The vertical bar, by its turn, is related to the depth of expertise, which usually has work and career as background (Lewrick et al., 2020).

Other team models and profiles are also referred by the authors, like the Pi-shaped profile which corresponds to a person who is adaptable and can educate him/herself to the everyday challenges, being able to assume different roles. This profile contributes to a flexible team environment. The horizontal bar of the symbol “ π ” is related, as in a T-profile, to the breadth of knowledge; the vertical left bar, is connected to the depth of expertise in one’s own core competency; and finally, the vertical right bar is linked to the depth of expertise in leadership (Lewrick et al., 2020).

A profile can be constructed through the HBDI® model where four quadrants are metaphorically represented – the left ones encompass thinkers and organizers, and the right ones represent innovators and humanitarians. The “thinker” section embraces analytical, technical, and financial skills and problem-solvers; “organizers” are characterized by implementation, administration, planning, and organization. In the right half it is possible to find the “innovators”, identified by integration conceptualization, creativity, and innovative skills; and finally, “humanitarians” are stamped by their teaching, writing, communication, and interpersonal skills (Lewrick et al., 2020).

To Lewrick et al. (2020), one of the most important factors to consider in a team is harmony. They value a team where everyone can rely on everybody else, promoting a secure and productive environment (p. 244).

Design thinking application in education

Kees Dorst (2015), defines today's problems as open, dynamic, complex, and networked. The author prioritizes the finding of new problem-solving approaches rather than conventional ones once they are formulated based on a static, isolated, and hierarchical environment.

According to Noel and Liub (2017), new pedagogies should be implemented in mainstream education empowering students to solve today's problems. Design thinking is referred as a powerful tool to promote the abilities needed once it is capable of fostering metacognition, and promotes collaboration and student engagement (Carroll et al., 2010).

Noel and Liub (2017), declare that the iterative nature of the design thinking process promotes the "growth mindset" – abilities are developed through effort. In that way, the person's true potential is impossible to predict once new skills and competencies can be developed through training. Fixed mindset, on the other turn, is the belief that abilities are set in stone, constantly needing to prove themselves over time, and analyzing situations by success or failure/ right or wrong. During childhood, it is important to balance some of these aspects since it is relatively easy to lead a child to these beliefs (Dweck, 2019).

Teachers and educators play an extremely important role in children's development; therefore, they should promote the needed skills in order to prepare students to today's world. The creation of an open learning environment is fundamental, so students can get involved and co-assume learning responsibilities (Anagün, 2018). Changes in early childhood education are happening, assuring the necessary skills for children to successfully develop in this modern society (Nunes et al., 2021). Design thinking encompasses several relevant skills. Therefore, Noel and Liub (2017) suggest that a design-based primary education could positively impact the urgent need for this skill-set development:

The parallel between these skills and the skills imparted through Design Thinking and Design education seem to suggest a significant opportunity for a new design-based education paradigm that focuses on design abductive reasoning and cognitive skills like curiosity, innovation and critical thinking as well as the development of social skills such as empathy, facilitation and collaboration (Noel & Liub, 2017, p. 10).

2.2.3 Challenges at today's schools

According to Wagner (2010) there are three fundamental transformations that schools must consider changing the education system - the fast-changing economy, which profoundly influences the world of work, the evolution of information and its respective accessibility, and finally the impact of media and technology on young people's life. These factors will influence what children need to learn. Based on these ideas, the author points out the two gaps in education systems. The first is related to the access to a quality education due to economic and financial differences in families; the second links to the differences between what is taught at schools, and what is needed in the real world; this happens once curricula, teaching methods, and evaluation processes were designed in a different era. Prensky (2016) suggests a change in the academic paradigm, by empowering and encouraging children to be a significant part of the world change (Fig 6):

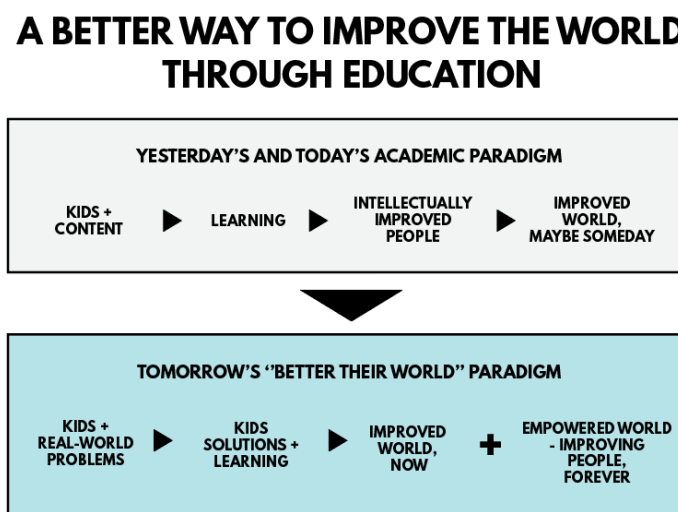


Figure 6, Improving the World through Education, adapted from “Education to Better Their World: Unleashing the Power of 21st-Century Kids”

This author also argues for changes in educational systems. He suggests four essential shifts: in *ends*, so children can actually improve their world and their education, a shift in *means* by applying passions to real-world accomplishments, a shift in expectations, instead of each discipline acts by itself, relationships, effective thinking, accomplishment, and action should be taught and finally, a shift in teaching methods, promoting an academic curricula which empower children with trust, independence, kindness, collaboration, and respect. Digital technology can allow students to collaborate with people from everywhere, combine and analyze databases, motivate people, apply robotics and artificial intelligence in their projects, and basically, discover any information about any topic; however, it has potential pitfalls, dangers, and unexpected negative outcomes (Twenge, 2017) which means it should not be applied critically in vulnerable contexts such as children's education.

Prensky (2016) affirms that “we need a new model of education that liberates the power of extended minds all networked together without trapping them in the vicious cycles of academic competition that we often see in today's schools” (p.14). He expects children to explore the world and solve problems in their formative years, although, in order to it, it is necessary to change the goals. The author affirms that *has been about improving individuals* (p.24), education in the future must be about improving the world, with individuals improving that. These changes can be done by giving all kids the opportunity to be heard, adding more types of school courses, such as STEM (science, technology, engineering, and math), taking into consideration the 21st-century skills (Prensky, 2016).

Childhood is the time of inventing and exploring, and as adults, it is supposed to encourage them to dream big. In a classroom, students must feel free. It must be a place that children like to be, where they are able to explore and discover, make mistakes, think, and be critical by promoting self-consciousness (Ayers, 2010).

2.3 Learning

2.3.1 Learning and deep processing

Kirschner and Hendrick (2020) declare that learning is a non-linear process, and it does not happen equally to everyone, however, the more aligned the methods are with the human cognitive structure, the more efficient the process will be. Learning is a change in long-term memory, the central structure of human cognition, and *where information is held indefinitely in schemata* (Kirschner & Hendrick, 2020, p. 168). The term “schemata” emerged with Jean Piaget in 1986, who describes it as a cognitive framework that organizes knowledge, skills, and ideas that can be used to process new information (Kirschner & Hendrick, 2020).

Kirschner and Hendrick (2020) claim that information retention depends on how it is processed. Relating new knowledge with what is already known results in long-term knowledge retention, and therefore, learning. In other words, new knowledge must be integrated into existing schemata, resulting in assimilation, followed by the alteration of that structure, the accommodation process.

David P. Ausubel, a cognitive psychologist, observes that to ensure that learners have the basis or the foundational knowledge to acquire and process new information, they must be exposed to advance organizers. They can possess different natures: expository, describing; narrative, telling a story; skimming: presenting an overview; or graphical which represents something visually. Summarizing, advance organizers are general and inclusive frameworks that are presented before new information introduction. In his studies, Ausubel 36-item was evaluated in two groups, showing that the group exposed to advanced organizers performed better. Through this study, he concluded that advance organizers improved verbal material retention, relating new material with prior knowledge, and the newly acquired knowledge was more resistant to obliviation (Kirschner & Hendrick, 2020 citing Ausubel, 1978).

To Robert Gagné (1968) learning prerequisite sequences must be applied and introduced at each lesson reviewing previous information, this way, new knowledge is integrated and related to what is already known ensuring learning. To the author, each lesson’s difficulty and complexity should also be adjusted to the learners. Reigeluth (1983) complements this idea by suggesting the

elaboration theory. This theory explains that by ordering the content from simple to complex, the student is able to learn in context, facilitating the process by building stable cognitive structures. To do so, it should start with a wide-angle view, understanding the major composition of the subject, then, zooming in to sub-part, after the sub-parts are studied, relationships between them must be established, and finally, by zooming back out the full understanding of the content is perceived. By continuing this pattern, it is possible to achieve the wanted level of detail. Ausubel's subsumptive sequencing, Bruner's spiral curriculum, and Norman's web learning are examples of sequential learning patterns that corroborate previous studies (Kirschner & Hendrick, 2020)

Rothkopf (1970), presents another variable for the learning process. He says "You can lead a horse to water but only the water that gets into his stomach is what he drinks"; this preposition refers to what the learner does with the offered information, establishing a direct relationship between the learner's activities and what is effectively learned. Kirschner and Hendrick (2020) declare that learning is related to cognitive processing. Whether and how the information is processed determines what is learned and remembered. Deeper analysis processing leads to better retention and learning.

According to Craik and Lockhart (1972), it is possible to process information in three different ways: structural processing, shallow processing which focuses on appearance and superficial characteristics; phonemic or graphemic processing, also a shallow type of processing, however, sounds are the encoded ones; or semantic processing, deep processing where meanings are assimilated and related to similar ones. Kirschner and Hendrick (2020) point out the differences between shallow and deep processing – the first one requires maintenance rehearsal, consequently, weak memory traces are developed leading to short-term retention; on the other hand, deep processing requires linking previous and new knowledge, developing persistent memory tracing, ensuring better retention leading to learning. The same authors declares that to ensure deep learning students must be encouraged to explore and encouraged to think about what they have learned; new information must be related to pre-existing knowledge and practical activities should be developed so students can apply the learned information in different situations; reviews must be provided and students should be able to resume what they learned in

their own words, and if possible, they should be encouraged to relate what was learned with personal experiences.

Complementing the previous literature, Roseshine presents the 10 principles of education, based on research about information acquisition and appliance, successful teacher's procedures, and procedures developed to help the student to overcome difficulties. (1) Begin a lesson with a short review of previous learning, (2) present new material in small steps with student practice after each step, (3) ask a large number of questions and check all the responses, (4) provide models, (5) guide student practice, (6) check for student understanding, (7) obtain a high success rate, (8) provide scaffolds for difficult tasks, (9) require and monitor independent practice, (10) engage students in weekly and monthly reviews (Kirschner & Hendrick, 2020).

2.3.2 Learning theories and techniques

Children entering today's schools possess qualities that reflect diverse backgrounds, encompassing differences in race, ethnicity, culture, and family histories. Coupled with these qualities is the variance of learning profiles, learning styles, abilities, and interests (Bushie, 2015, p. 35). Therefore, ensuring that a student learns might not be a simple task since they all have different cognitive structures; this is to say that what works better for one person might not result as all for another. Based on this idea, the differentiation theory was formulated.

This theory remarks on the need for tailoring instructional methods for different learners, maximizing the learning process. "[It] can be defined as an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom" (Tomlinson et al., 2003, p. 121). However, it "requires teachers to develop advanced professional skills in addition to their basic skills of classroom management and general didactics" (Deunk et al., 2018, p. 31). The same author declares that differentiation can combine several practices such as grouping, progress monitoring, using adapted learning materials, modifying content, instruction adaptations, and should also consider students' cognitive capacities, motivations, and interests (Deunk et al., 2018).

Differentiation theory can be related to Gardner's multiple intelligences. Howard Gardner developed this theory in 1983 affirming that all human beings possess a set of intelligences – linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, and personal intelligences. Linguistic is related to the sensitivity and ability to use words, whether spoken, by gestures or writing, reaching certain goals through them (Gardner, 2011); Musical intelligence is defined as the “ability of individuals to discern meaning and importance in sets of pitches rhythmically arranged and also to produce such metrically arranged pitch sequences as a means of communicating with other individuals” (Gardner, 2011, p. 103). Spatial intelligence connects to the ability to recognize instances of the same element, the ability to transform or to recognize a transformation of one element into another, the capacity to conjure up mental imagery and then to transform that imagery, the capacity to produce a graphic likeness of spatial information, and the like (Gardner, 2011, p. 185). “Bodily-kinesthetic has two core abilities, control of one's bodily motions and the capacity to handle objects skillfully” (Gardner, 2011, p. 218), and finally, personal intelligence, which can be observed from two different perspectives, intrapersonal and interpersonal – intrapersonal skills are linked to the ability to identify and express own's feelings, and interpersonal intelligence which is directed to others, being able to infer about their moods, temperaments, motivations, and intentions (Gardner, 2011).

Other learning theories had emerged such as constructivism. A theory developed by Jean Piaget, who was considered the “father of constructivism” (Minnesota State University, 2014). This theory defends that knowledge is acquired from experiences, originating different constructivist approaches such as problem-based learning, inquiry-based learning, discovery learning, experiential learning, case-based learning, project-based learning, and service-learning (Kirschner & Hendrick, 2020; Minnesota State University, 2014). This approach suggests that “Effective teaching involves engaging the student with real-world applications of how to use a tool instead of simply giving a list of prescribed instructions.” (Minnesota State University, 2014, p. 2), by presenting information in different contexts, revisiting it, and applying it to different situations (Minnesota State University, 2014).

Rothkopf, an American educational psychologist, in 1970, formulated the theory of mathemagenic activities – activities that promote learning. This theory was one of the first ones to put the learner in the center of the learning process rather than the teacher or facilitator (P. A.

Kirschner & Hendrick, 2020). He settles that “what is learned depends largely on the activities of the student” (Rothkopf, 1970, p. 325).

“Certain ambient factors such as appropriate student behavior, classroom climate, and the appropriate use of technology are critical to stimulating mathemagenic activities” (Kirschner & Hendrick, 2020), which can be divided into three categories – orientation, object acquisition, and translation and processing activities. Orientation activities guide the student towards what was learned, in order to it, the student's attention has to be retained and distractions have to be managed; object acquisition activities are about studying a specific thing in a specific way; and finally, translation and processing activities involves influencing the way how the student looks at a certain material. These last activities category has three steps, translation, where the student visually focuses on parts of a whole, segmentation, by syntactically analyzing these parts and relating them, and at last, processing, assimilating new information into the existing knowledge. In opposite to mathemagenic activities, which promote learning, there also are mathemathantic activities, described as activities that kill learning (Kirschner & Hendrick, 2020).

Aligned with Rothkopf's findings, Zimmerman (1989) proposes a social cognitive view of learning, presenting a definition for self-regulated learning – “students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process (...) direct[ing] their own efforts to acquire knowledge and skill rather than relying on teachers, parents, or other agents of instruction” (p. 329). In order to fully understand Zimmerman perspective, it becomes necessary to clarify what self-regulation is. Self-regulation encompasses the ability to manage behaviors and emotions and it is used as basis for the model proposed by the author, who symbiotically relates personal, behaviors and environmental factors as active influencers on the learning process; verbal persuasion, direct assistance, modelling, and the structure of the learning context are environmental factor who influence self-regulation (Kirschner & Hendrick, 2020; Zimmerman, 1989) Students who possess self-efficacy strategies tend to have better learning outcomes, and to be more effective learners (Kirschner & Hendrick, 2020).

There are different ways to learn – kinesthetic, visual, and auditory learners. The kinesthetic learners are the “hands-on” learners, the ones who learn by doing; visual learners, who learn from information presented in a visual way, through pictures, diagrams, or charts; and finally, the

auditory learners, who learn best in a group discussion or lecture. However, at least three problems emerge with this perspective. A great amount of learning styles studies is based on what people say they prefer, so results appear for learning preferences rather than learning styles; there is a big gap between learning styles and what effectively leads to better learning once preferring something doesn't make it the best option for someone; by last, learning styles promotes the existence of groups, although there is no evidence for them (Kirschner & Hendrick, 2020). The same author points out an emergent problem from this point of view – most students don't know the best way to learn. Teachers and knowledge facilitators should present their students with different learning techniques which include elaborative interrogation, self-explanation, summarization, highlighting, the keyword mnemonic, imagery use for text learning, rereading, practice testing, distributed practice, and interleaved practice. Dunlosky (2013) evaluates these techniques according to their benefits in four parameters – learning conditions, encompassing aspects such as the practice amount, open vs. closed book practice, reading vs. listening, incidental vs intentional learning, direct instruction and discovery learning, rereading lags, kind of practice tests or group vs. individual learning;; the student's characteristics, including age, competencies, prior knowledge, memory capacity, verbal ability, interests, fluid intelligence, motivation, prior achievements and self-efficacy; and material, which can variate from simple to complex concepts or set of ideas trough vocabulary, translation, lecture content, science definitions, narrative and expository texts, mathematical concepts, maps or diagrams (Dunlosky et al., 2013; P. A. Kirschner & Hendrick, 2020).

Technique	Description
Elaborative interrogation	Generating an explanation for why an explicitly stated fact or concept is true.
Self-explanation	Explaining how new information is related to known information, or explaining steps taken during problem-solving.
Summarization	Writing summaries (of various lengths) of to-be-learned texts.

Highlighting/underlining	Marking potentially important portions of to-be-learned materials while reading.
Keyword mnemonic	Using keywords and mental imagery to associate verbal materials.
Imagery for text	Attempting to form mental images of text materials while reading or listening.
Rereading	Restudying text material again after an initial reading
Practice testing	Self-testing or taking practice tests over to-be-learned material.
Distributed practice	Implementing a schedule of practice that spreads out study activities over time.
Interleaved practice	Implementing a schedule of practice that mixes different kinds of problems, or a schedule of study that mixes different kinds of material, within a single study session

Table 3, Learning techniques studied by Dunlosky, 2013, retrieved from Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology

Dunlosky (2013), in his study, classifies summarization, highlighting, the keyword mnemonic, imagery use for text learning, and rereading as low utility assessments, and stresses practice testing and distributed practice as the two most effective techniques. The practice testing will ensure long-term retention, remembering the information better and for a longer period; distributed practice is about spreading the study and practice – for example, studying for 30 minutes a day – leading to long-term knowledge retention as well. The concept of distributed practice is the opposite of cramming – study for a long period immediately before a test, resulting in short-term retention. Long and short-term knowledge retention is related to the forgetting curve proposed by Ebbinghaus in 1885. This curve prompts that what is read or learned quickly, is also forgettable over time, unless the content is reviewed over time (Kirschner & Hendrick, 2020 citing Ebbinghaus, 1885):

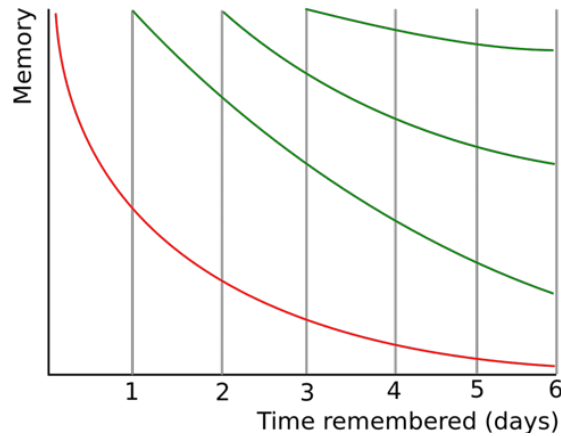


Figure 7, Forgetting curve suggested by Ebbinghaus in 1885, retrieved from:
<https://www.psychestudy.com/cognitive/memory/ebbinghaus-forgetting-curve>

Clear understanding of learning technique and styles could have a positive impact on students' achievements, rather than substantially improve educational systems (Kirschner & Hendrick, 2020).

Promoting learning: problem solving and instruction

Newell and Simon (1972) formulated the *problem-solving theory*, postulating that people have problem spaces – intern representations of a problem that might look different than its external view. The theory sets a scenario where the information-processing system of the problem-solver is confronted by a task, defined by the problem. It can be shaped in four statements – just a few characteristics of the human information-processing system are immutable over the task; these characteristics determine a task environment, represented as a problem-space, *the space* [where] *problem-solving activities take place* (Newell & Simon, 1972, p. 59) the structure of the task environment influence problem space structures; and finally, the problem spaces' structure influence problem-solving strategies (Newell & Simon, 1972). Premack (2007), suggests that short-term memory is limited, affecting problem-solving abilities by limiting the considered alternatives. The authors define structure as the opposite of random; by exiting a structure, the individual will look for an answer in a systematic way rather than trying every possibility, this means that in order to a student successfully solve a problem, he must know where to start and

what to do (Newell & Simon, 1972). Kirschner and Hendrick (2020) declare that the more spaces a problem has, the more structured thinking it requires, therefore, the teacher needs to evaluate the necessary knowledge to creatively explore a problem, making sure they have the needed prior knowledge.

Teachers can provide the necessary support through scaffolding, a form of differentiation where students receive guided support which is systematically removed over the learning process; the teacher must therefore recognize the student learning journey. Kirschner and Hendrick present the six functions of scaffolding:

“(1) Recruitment: The teacher must somehow elicit the problem solver’s interest in the task and the kinds of skills needed to complete it.”; (2) Reduction in degrees of freedom: This essentially refers to the teacher simplifying the task to a much smaller number of possibilities so that the tutee is not overwhelmed; (3) Direction maintenance: Keeping the tutee interested and focused on the task; (4) Marking critical features: The teacher should mark out or emphasize key milestones in the development of the task; (5) Frustration control: Having empathy concerning the possible frustration of the child is a vital aspect of scaffolding;6 Demonstrating: It is not enough to simply model solutions to a task, the effective teacher will perform an “idealization” of the task to be performed.” (Kirschner & Hendrick, 2020, p. 122).

Summarizing the prior ideas, scaffolding is the support provided by the teacher or facilitator which is gradually removed as the student acquires the requisites to solve a problem by himself; this means that the student with different levels needs different guidance, they must have lower-level skills in order to upgrade to the next level (Kirschner & Hendrick, 2020).

The same authors also establish the difference between minimally guided instruction and explicit/direct guided instructional. The first is described as less effective and efficient than approaches that focus on guiding students’ learning process once the learner discovers what should be learned, based on the idea that students who manage their own solutions or acquire complex knowledge leading to an efficient learning and knowledge are better-acquired through experience. In terms of practice, teachers offer a rich-information environment where the students are supposed to learn concepts and skills necessary on their own. The main problem with this approach is that while the working memory – the place where new information is processed,

which is limited in duration and capacity – is looking for what it should be learned, it is not able to process and integrate new information in the existing one; therefore, it is not available to learn (Kirschner & Hendrick, 2020). This approach can acquire different titles, such as discovery learning, inquiry learning, experiential learning, and constructivism learning (Kirschner & Hendrick, 2020, p. 168). In opposition, explicit or direct instruction provides a full explanation of the concepts and procedures that students should learn, as well as learning strategies for it.

Siegfried Engelmann (1998) formulates the Direct instruction theory, which can be used in a wide spectrum of institutional situations. It is presented as an approach to establishing new behaviors and maintaining it, although it requires great effort from the teacher once skills to be taught must be analyzed, as well as the learner, and the type of teaching to ensure it. With this analysis and a correct application of this approach, the teacher will control every variable which influences the student's performance. Kirschner and Hendrick (2020) add that it involves well-developed and planned lessons which can eliminate misconceptions and can encompass *techniques as working groups, participation labs, discussions, lectures, seminars, workshops, observation, active learning, practical assignments, and internships* (Kirschner & Hendrick, 2020, p. 176). Contrasting, Rosenshine developed the theory of direct instruction, described by the following steps:

“Begin a lesson with a short review of previous learning; present new material in small steps with student practice after each step; limit the amount of material students receive at one time; give clear and detailed instructions and explanations; ask a large number of questions and check for understanding; provide a high level of active practice for all students; guide students as they begin to practice; think aloud and model steps; provide models of worked-out problems; ask students to explain what they have learnt; check the responses of all students; provide systematic feedback and corrections; use more time to provide explanations, and provide many examples” (Rosenhine, 2010, p.7 cited by P. A. Kirschner & Hendrick, 2020)

According to Hattie and Timperley (2007), feedback is one of the most powerful mechanisms of learning and achievement. It must answer three questions, “Where Am I Going?”, “How Am I Going?” and “Where to Next?”. Paul Kirschner (2020) proposes a model where he suggests three

types of feedback, corrective feedback, where is said what is right and wrong, relating actions and behaviors with visible results; directive feedback, pointing out right and wrong and explaining how to improve or correct it; and finally epistemic feedback, encouraging the student to the “who”, “why”, “what”, “when” and “how” of the task:

To really harness the power of feedback it is vital to cultivate an environment where students have a clear sense of where they are going to, how they are currently doing against that goal, and what to do about it to close that gap (Paul Kirschner, 2020, p. 204).

2.3.3 Learning conditions: motivation and environment

Schools have an extremely important role in children's development since they are the bridge between evolution and culture that will transform children into young adults integrated into modern society. (P. A. Kirschner & Hendrick, 2020).

Most children are motivated to learn in the early school years, however, that motivation tends to disappear at the end of primary school because learning stops being fun, students start to compare themselves with each other and they start to feel system formatted (Levine, 2012). Kirschner and Hendrick (2020) declare that children's motivation depends on their interests, therefore, it is possible to motivate them by connecting them with their natural way of learning. Paul Pintrich (2003), following the work of Bohr and Pasteur about the scientific understanding of motivation, learning, and teaching, formulates the goal theory, which will explain the importance of students' motivation in the educational system. The author proposes that “future research on achievement goals needs to move beyond a simplistic mastery goal (good) versus performance goals (bad) characterization to consider multiple goals, multiple outcomes, and multiple pathways to learning and achievement in multiple contexts.” (p. 676). The theory is concerned about the needed motivation to start working on a task, based on three major factors, values, which encompass task values and achievement, expectancies, including beliefs, self-efficacy, and success expectancy, and affect, a dimension concerned with self-esteem. Pintrich (2003) relates the task value with achievement goals. The difference between performance goals is also established. If performance goals are approach oriented, the main objective is to demonstrate competencies and abilities, if performance goals are avoidance oriented, then the student avoids looking bad; and mastery goals: if mastery goals are approach oriented the student will work in order to fully learn, if

mastery goals are avoidance oriented, the student will work because if he do not, then he will not master or learn everything that can be learned (Kirschner & Hendrick, 2020; Pintrich, 2003).

In students' perception, performance is often related to academic outputs. They tend to attribute success to ability, task difficulty, effort, and luck (Kirschner & Hendrick, 2020). However, the causes for success or failure are not always clear. Bernard Weiner (1985) declares that success and failure have three common properties – locus, stability, and controllability – and based on this idea suggests the theory of motivation and emotion: “The theory therefore relates the structure of thinking to the dynamics of feeling and action.” (p. 548). Kirschner and Hendrick (2020) declare that “student's emotional response to performance can profoundly affect future motivation” (p. 103).

The social environment is also one of the biggest influencers of children's learning, however, the first authors to study learning by modeling and observation saw learning and context as unrelated to each other. This idea started with Bandura who declares that self-monitoring reinforcement can be transmitted to children by exposing them to adults' and peers' behavior, developing the “social learning theory”, which suggests that it is possible to learn by modelling and observation (Bandura, 1969). In 1971, he argues that social modeling has a great impact on children's development and suggests four sub-processes in human learning behavior – Attention and retention, which are both cognitive processes, followed by motivation and motoric, non-cognitive processes. However, he has only investigated imitation of simple responses such as aggression (Kirschner & Hendrick, 2020).

Based on Bandura's studies, Zimmerman (1983), will investigate “complex classes of social learning, such as the development of emotional reactions (attraction and avoidance), cognitive and linguistic rules, self-regulating responses, personal standards, expectations, and self-efficacy judgments” (p. 1), concluding that children's knowledge was influenced by their social environment. At this point, a new concept emerged – contextualism (Kirschner & Hendrick, 2020; Zimmerman, 1983). It is situated by the first author as “Viewing cognitive processes in the real world” (Kirschner & Hendrick, 2020, p. 223) while the second author defends that contextualists “assume that reality is dynamic and continuous in \$ow and that knowledge is the ever-changing cumulative product of one's personal transactions with the proximal and distal environment” (P. A. Kirschner & Hendrick, 2020 citing Zimmerman, 1983, p.17). Labouvie-Vief

and Chandler identify four parts of contextualism: (1) person-environment interactions, where the environment encompasses the physical world and other's thoughts and actions; (2) holistic phenomena, meaning that events are processed in multiples elements, and the relation between them, entitled as strands, therefore, a simple question (the event), can be understood by someone according to intonation, facial expression, individual character, and location – elements, that will influence strands, and finally contribute for the interpretation of the final event; (3) comprehension and dynamic, once it is not possible to study the human mind away from the environment since it is the main stimulus; and finally, (4) the ongoing and diverse development, declaring that certain “steps” of life, such as entering in school or move from a city, have more influence over performance than age or stage of development (Kirschner & Hendrick, 2020). The last parameter is opposed by stage-theorists, who claim that “human development is universal, sequential and hierarchical” (P. A. Kirschner & Hendrick, 2020, p. 225). Zimmerman (1989), following the contextualism approach, hypothesis that experience – familiarity degree to something – and age are unrelated concepts. A significant proof of the previous statement is given by Dommaraju Gukesh, an Indian boy who defeated the champion Magnus Carlsen at the age of sixteen (Express News Service, 2022). By the record, Carlsen is 32 years old and started to play chess when he was five (Gregersen, 2023) while Dommaraju Gukesh is 16, and learned to play chess at 7 years old. Kirschner and Hendrick affirm that “It's not so much a child's age that determines performance but rather their previous knowledge based in their social experience.” (Kirschner & Hendrick, 2020, p. 229).

By the studies presented it is possible to infer that social learning needs to be considered, always considering the contextual nature of the learner. Kirschner and Hendrick (2020) suggest imitation and role-play as teaching techniques since learners need to see tasks being performed so they can understand, assimilate, and process each step or phase. Contextual learning has been given more attention in schools, and according to Brown et al. (1989), school and life have become two separate terms with different cultures and rules. The author declares that school must teach things that learners can use outside, transferring their knowledge by using it in different contexts. He settles that learning should be situated in the real world, so students can develop:

“(a) intuitive knowledge, the kind of shortcuts people invent when doing multiplication problems in authentic settings; (b) computational knowledge, the

basic algorithms that are usually taught; (c) concrete knowledge, the kind of concrete models of the algorithm associated with the stories the students created; and (d) principled knowledge, the principles such as associativity and commutativity that underlie the algorithmic manipulations of numbers” (Brown et al., 1989, p. 38).

The same author even suggests that in order to students learn in the real world, the content must be less abstract and more integrated in authentic contexts. By putting them to work together in a problem, they must share perspectives and agree in a single solution, similar to what happens in an everyday situation. The opportunity to share their thinking and senses improves social skills. So, if they gain confidence and get familiar with different material, they will be able to apply it in a multiple range of situations (Brown et al., 1989; P. A. Kirschner & Hendrick, 2020).

3 CHAPTER III – METHODOLOGY

3.1 Study context

The study involved the preparation of a design thinking intervention, the design of models for each class, and the construction and approval of a survey. Two groups were considered - the intervention and the control group. The first group encompassed 14 children from the 5th grade between 9 and 10 years old and took place at E.B.I/J.I do Couço; and the control group was composed by 13 children with the same attributes, although from a different school - Escola EB 2,3 Armando Lizardo. The study lasted for three months, and it was inserted at Citizenship Education - a discipline focused on the students’ understanding of the surrounding world. It aims to improve attitudes and behaviors in society, helping them to construct values based on equity, democracy, and social justice (Direção Geral da Educação, 2022). Each session had 45 minutes, being the first morning period, and happened once a week.

No work beyond classes was required. During this period, each group learned about different subjects; the proposed themes for the discipline were – childhood exploitation, gender equality, bullying, and sustainability. They would have it learned it through videos and discussions in the classroom. In this study, the proposed themes remained the same, although they would learn about them through a design thinking approach.

3.2 Description

The present study assumed an observational and interventional nature with the purpose of collecting quantitative and qualitative data. The data was collected through direct observation in classes and through the application of surveys, to the students and teachers.

The surveys evaluate seven soft skills identified based on the references in the literature review, crossing information between the soft skills needed for 21st-century society and the soft skills used in the design thinking process (Fig 8). The seven soft skills were teamwork, empathy, communication, systemic thinking, creativity and problem-solving, leadership, and critical thinking.

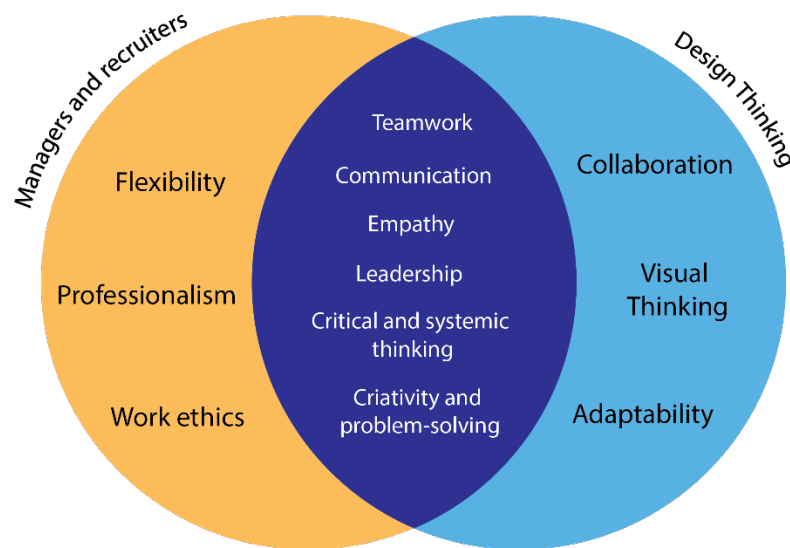


Figure 8, Soft skills wanted by managers and promoted by design thinking

In order to evaluate the presented soft skills, each one was defined, and five statements were constructed (Table 4):

Soft skill	Definition	Statements
Teamwork	I can work with different people, collaborating and respecting all group members in order to find the best solution for a problem	• I Respect group members • I value the collaboration of all elements • I share my knowledge • I work with different people • I collaborate, trying to find a solution to a problem
Empathy	I put myself in the other's shoes, trying to understand different perspectives, behaviors, motivations and concerns	• I am understanding • I put myself in the shoes of others trying to understand them • I listen and observe in order to understand feelings or concerns • I can tell when a friend is not feeling well, even if he/she doesn't say so • I treat others the way I want them to treat me
Communication	I communicate clearly and objectively, being able to convey ideas and opinions.	• My colleagues understand me easily • I share my opinions • I defend my views • Respect different points of view • I present good arguments to defend my opinions
Systemic thinking	I have the ability to analyze and synthesize information, perceiving and interpreting patterns.	• I can summarize information • When I'm reading a text, I identify the main ideas • I relate ideas, establishing links between them • When I make a decision, I analyze the pros and cons, and only then do I make my final decision • I'm not impulsive
Creativity and problem-solving	I try to find different ways of doing usual things. I think outside the box and look for innovative solutions to my problems.	• I try to have new ideas • I am curious • I strive to find solutions to my problems • I have a vivid imagination • I can relate different ideas
Leadership	I can delegate tasks, organize my work and set priorities.	• When I work in a group, I am the one who distributes the tasks • I understand which tasks need to be done first • I have initiative

		• I am not easily influenced • I can motivate my group members
Critical Thinking	I have the ability to criticize my own work and I know how to recognize when I need to improve.	• I easily accept criticism of my work • I recognize when I need to improve • I detect inconsistencies and present alternatives • I talk to people outside of school/other groups about the work I am doing • I consider criticism to present the best work possible

Table 4, Soft skills evaluated by the survey

The statements are related with the students self-perception in a variety of situations; the students should read them, and indicate, through a 1 to 5 Likert scale, their agreement with the sentence – 5 for “totally agree”, 1 for “don’t agree at all”. For children, those statements were randomly disposed into the survey, Appendix – Section II, therefore, they did not know which soft skill corresponded to each sentence. The teachers, who evaluate each student, had access to the group of statements associated with each soft skill, evaluating the soft skill instead of the statement, Appendix – Section III.

Through the application of the surveys, before and after the intervention, data of the perception of students and teachers were collected. The data allowed to understand the intervention’s impact.

3.3 Intervention design and environment

The study was designed for children to experience the design thinking process. The Double Diamond Model (Design Council, 2019) was the chosen one, once it could be easily explained to students, and included the types of thinking required for each phase. The original model terms were altered so students could easily relate their work with the model stage (Fig. 9):

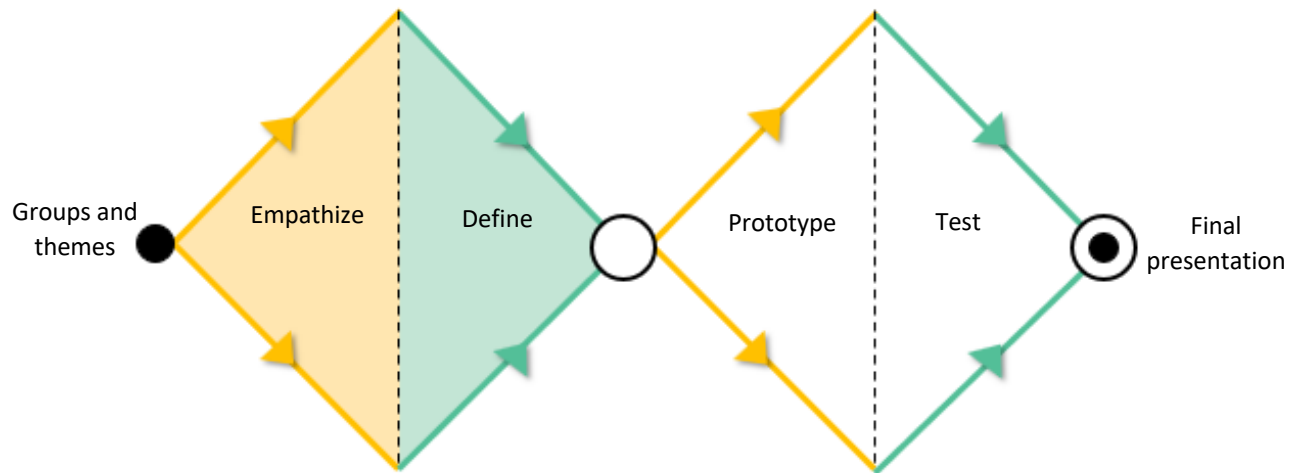


Figure 9, Model presented to the students

Excluding three lessons, (the first two and the final one) we had a total of ten lessons to work, that is to say, that the design thinking process was adapted, not only for their ages but for the ten available classes as well.

Along the process, children were situated in a Double-diamond model, associating their work with the stage they were experiencing. In order to provide this context, documents and models were previously prepared and distributed throughout each lesson. During the process, it was prioritized the use of post its. The materials for each stage, including the final presentation, can be consulted in Appendix – Section I.

These materials were created not only to maintain the students' interest and motivation but also to provide them guidance along the process. Through these materials, they have experienced the full process of Design Thinking.

Every morning, the children lined up at the classroom's door, entering after the teacher and seated one by table. During the intervention, the classroom assumed different spaces.

At the empathize and define stage of the Double Diamond Model, students worked in the “technology classroom”, where they had computers and Internet access, this way they could search for the needed information to fill the materials. During the ideation stage, they worked in different places; the individual phase took place in their usual classroom, while the group phase was performed in the school library, where there were round tables, which facilitated communication and the needed discussion between the members. At the prototyping stage, they worked in the regular classroom, although, in the following stage - test - they went to the 7th grade classroom to present their work and ask for feedback. The final presentation was made in their classroom. During this time, the interventionist moderated and conducted the lessons, although the teacher was always present, providing the needed support. A relationship based on respect, friendship, and empathy was cultivated between the interventionist and the students.

4 CHAPTER IV - RESULTS

The children need a way to develop their soft skills, as they are extremely important for their personal and professional future. This study will provide clear insights about the possibility of a design thinking intervention promoting the development of soft skills in children. The results were collected through direct observation in the intervention group, and surveys filled by the students and respective teacher in both groups - intervention and control.

4.1 Observation in the intervention group

The first class began by asking the students what they thought Design Thinking was; most of the answers were related to arts and drawing activities. After that, they were introduced to the Double-Diamond model, and the lesson’s dynamic was explained; including how they will be working in the next classes - by groups. They formed the groups without any intervention and the themes were randomly distributed by the four groups; however, they had the chance to trade their theme or suggest a new one, even though it did not happen. This means that the first group worked on childhood exploitation, the second on gender equity, the third group explored sustainability, and the fourth and final group worked on bullying. In the remaining time, each student wrote or drew something about their theme, which allowed to understand their prior knowledge.

The following lesson took place at the “Technology Classroom” and it was dedicated to the empathize stage. The students felt happy and anxious about going to this classroom. In there, they sat by groups, and it was explained that in order to solve a problem we must, first, to understand it. That said, a previously prepared model was delivered to help them to better understand their themes by answering four questions (Appendix, section I, Fig. 1). They should use the available online information, to answer the questions by writing or drawing in the post-it’s what they considered to be relevant.

The groups divided the questions by the number of members, working in pairs, or trios. The first group had some difficulties with their dynamics, Carolina was not respecting her colleagues' difficulties and doubts; for Miguel, the information collection was difficult, although, with some scaffolding he was able to answer correctly. At this point, he felt motivated and proud of himself. The second group completed the task successfully, collecting pertinent information, however, the lack of resuming capacity was notorious. The sustainability group immediately started distributing tasks, and collecting relevant information, although they placed it in the wrong places. And finally, the last group was the only one that integrated the previously written statements.

As the previous lesson, this lesson took place, in the “Technology Classroom”, and the students react exactly the same way as before. The previously filled models were distributed this time, and the groups should move to the definition stage. They should consider the previously collected information to formulate an initial problem statement; so, they answered three questions, (1) What is the problem? (2) Who is affected by the problem? (3) What is the major consequence? Based on their answers, they were able to construct their problem statement (Appendix, section I, Fig. 2). At this point every group felt the need to improve or change the nature of the collected information, however, they all found extremely relevant problems to solve.

The third and fourth lessons were dedicated to the ideation stage. The third lesson started by situating the students in the process, showing the developed work until that moment, and associating it to the process stage. It was explained that they should think about solutions for the problems they have identified. To stimulate their creativity, the students experienced the “Pizza

Challenge”. In this lesson, each student filled out a sliced pizza figure with four ideas (Appendix, section I, Fig. 3). They were encouraged to think out loud and talk to each other, alerting them that even though this task was individual, they were a group, so if there were similar ideas, it was not a problem; at this moment quantity is prioritized over quality; “To have a good idea, you must first have lots of ideas” (Brown, 2009, p. 42 citing Linus Pauling). The students were also encouraged to write every single idea they had, even if they thought it was a bad idea. In the ideation stage, there are no bad ideas.

In every group, someone said that they were not able to think about all four ideas once they “had given all their ideas to their group members, and now, they did not know what else to write”. Carolina was upset with that situation, and when the interventionist tried to help her to develop new ideas, she was resistant, thinking none of them would ever work.

Joana and Margarida in the gender equality group were the moderators, they were asking questions to the members and were really interested in understanding their perspectives. When all members had the four ideas, they stopped to think, concluding the task successfully. In the bullying group, Maria was not contributing to the task, so Ana tried to motivate her. She filled her model and kept thinking about new ideas, “giving” them to her team members, until they all complete their models. After it, she kept adding post-its with new ideas to her model.

In the following lesson - fourth - children must choose the four better ideas in order to build the group's pizza and evaluate the chosen ideas according to a prioritization matrix oriented by effort and impact. Based on this evaluation, they choose their final idea (Appendix, section I, Fig. 4). The process of choosing the four ideas for the group pizza, was, for some students, uncomfortable. In the first group, it was necessary to help them to find an effective way of working together, Carolina was getting frustrated once the remaining team members were not focused. In gender equity, Santiago got sad because none of his ideas were chosen, Joana and Margarida intervened by telling him that even though his ideas were not chosen for the group's pizza, he was doing a great job. He got motivated, accepted, and agreed with the chosen ideas and kept being participative and collaborative. The sustainability group had the better dynamic. All members were respectful, and their purpose was to find the best solution to their problem. When they moved to the prioritization matrix, they felt the need to re-choose their ideas. When asked the reason, Diogo said that they have decided that it would work better according to their

problem. In the last group, Ana and Bruno comforted Maria, once her ideas were not chosen for the group's pizza, although they also asked her to be more participative. The group's dynamic improved at this point.

In the fifth lesson, they were shown what is to prototype and rushed to it. In the model constructed (Appendix, section I, Fig. 5), they add the post-it with the idea they choose to prototype and selected the type - product, service, or UX/UI. The goal was to get a fast tangible representation of their ideas.

At this moment, sustainability and bullying groups changed the previously chosen idea, appealing that the new one would have more impact. The sustainability group discussed the scenario of their solution and drew it, then, each member completed the base draw. The remaining groups were concerned about their drawing skills. The intention was to deliver the prettiest possible draw.

The sixth and seventh lesson was dedicated to the test stage. But before, all their work was reviewed and aligned, matching the collected information with the problem statement and the final chosen idea. Then they were informed that in order to understand if we had a viable solution, we must test it. So, it was planned a visit to the 7-grade, where they would explain their work to the other students, and asked their opinions, and improvement suggestions. At this point, a document entitled "How to ask for feedback?" was prepared and presented, and a new model to fill was delivered in order to help their presentation (Appendix, section I, Fig. 6 and 7).

The seventh and eighth session was totally dedicated to feedback with the 7-grade. They were encouraged to divide the questions among the members, so all of them had the opportunity to talk. However, only one/ two people per group talked. Carolina, Joana and Margarida, João, and Ana, presented their group's work with confidence, clarity, and objectivity. In the classroom, their efforts were recognized. The students felt proud of themselves. After that, they improved their solution based on the collected feedback, concluding the design thinking process model.

In the ninth lesson, they were explained how to do an oral presentation, and they started to fill out the "helping cards" (Appendix, section I, Fig.8). The "helping cards" were personalized for each group, adapting the questions and the talking time to the number of members in each group (Appendix, section I, Fig.9 to Fig. 12). The objective was to provide them a solid base for their

presentations. They wanted to keep their cards, so they can prepare the final presentation. In the last lesson, they had their final presentations, and the intervention was concluded. They all read the cards, including their colleagues' names.

4.2 Surveys

In the first moment, it will be shown the averages of the study, from the students' and teachers' perspectives, in the intervention and control group.

Secondly, two of the seven soft skills were selected - teamwork and creativity and problem-solving - in order to observe the values at the different stages of the study. The two graphics below present the results for the first mentioned soft skill from the student and the teacher's perspective, in the intervention and control group. The following pair show the results for the second-mentioned soft skill, creativity and problem-solving, again, from the student and the teacher perspective, in both study groups. Note that the values presented for students are based on the average calculated from the statements associated to each soft skill.

The results illustrated for these soft skills are transversal to the remaining ones. For detailed and complete results please consult Appendix, section IV, for the intervention group, and section V for the control group.

Please note that the results are longer than those presented in this chapter and the student's names were altered, in order to protect their identities.

4.2.1 Surveys' averages

Below it will be presented a chart, resuming the averages for each child from both the intervention and control group, according to the students and teacher perspective:

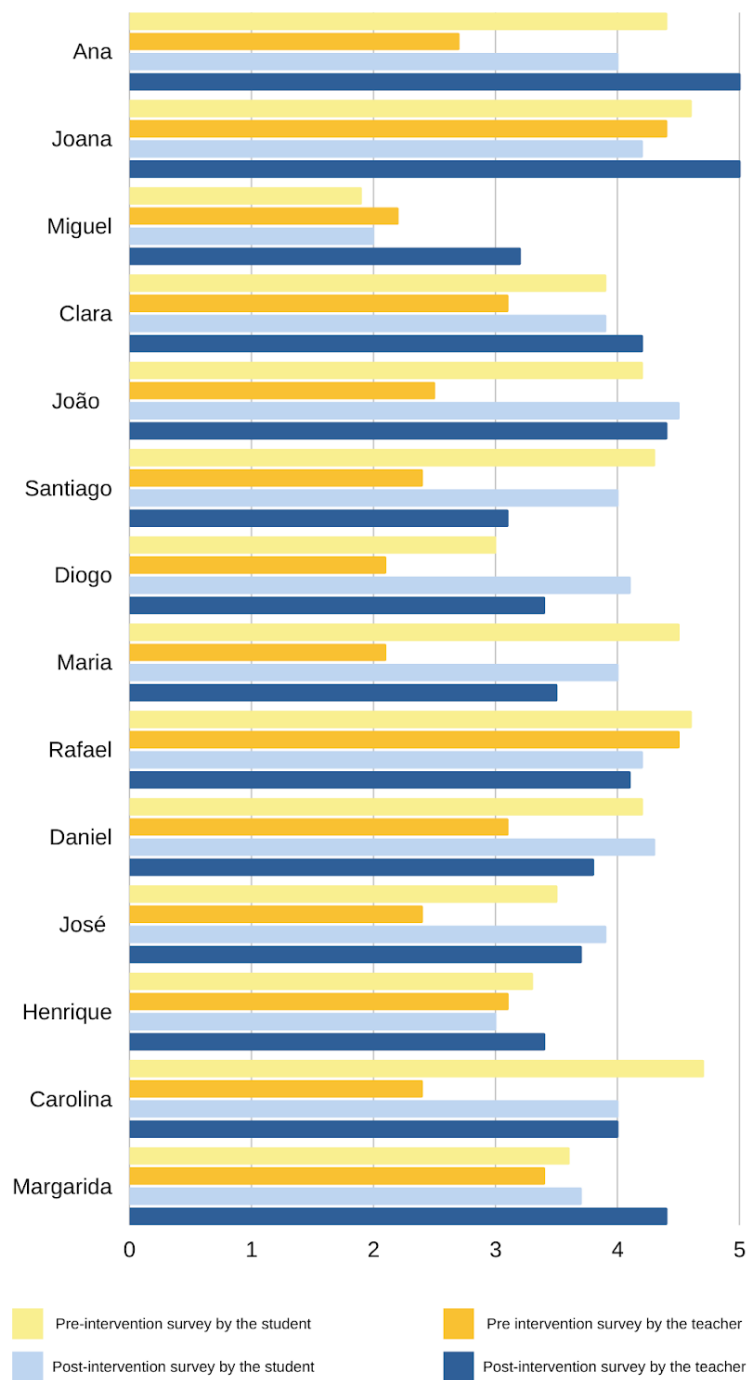


Figure 10, Children’s survey averages from the intervention group

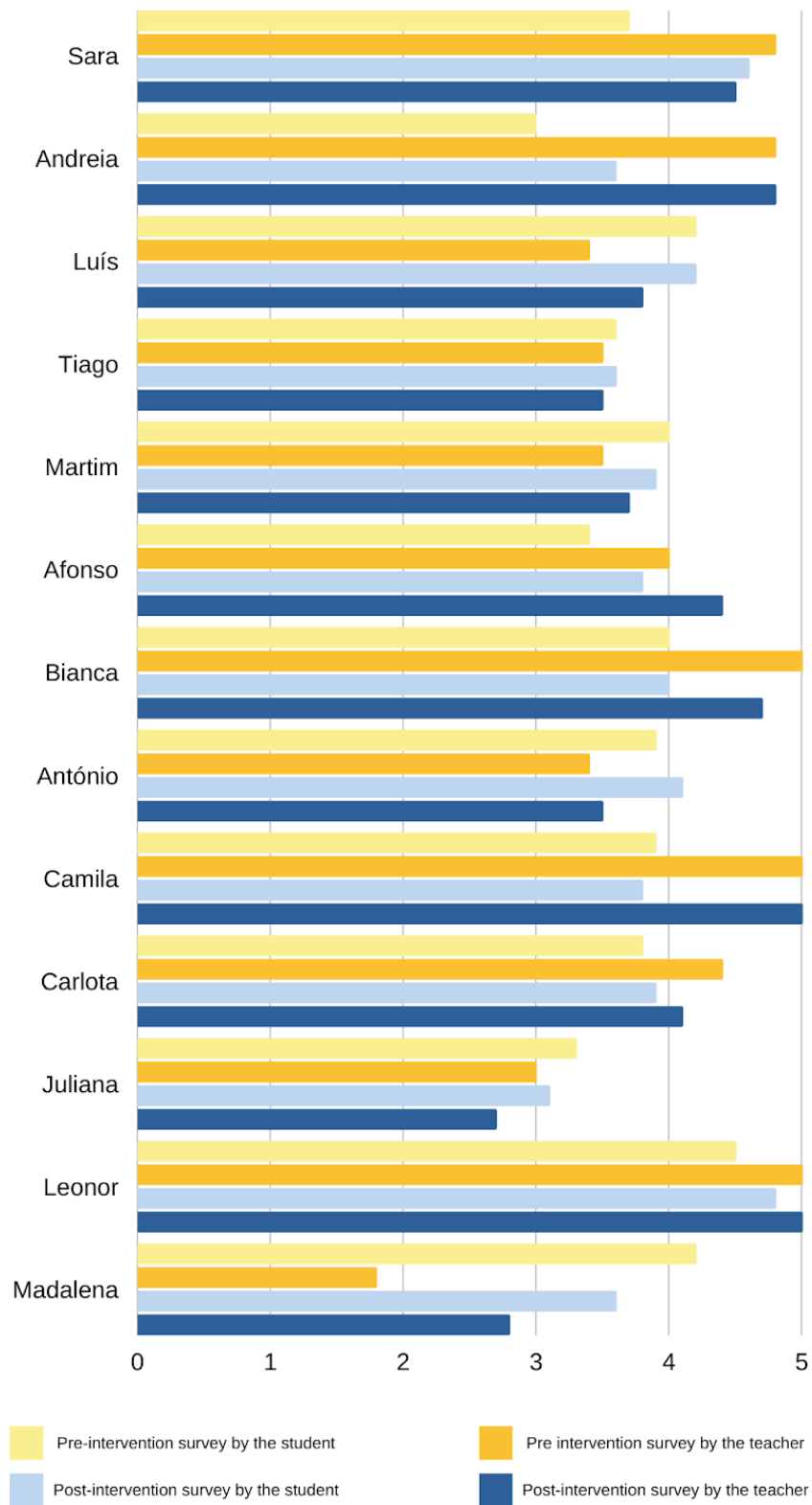


Figure 11, Children's survey averages from the control group

4.2.2 Soft skills averages

The averages will now be presented for teamwork and creativity and problem-solving, in both groups. Once more, the results for these soft skills are transversal to the remaining ones. The first two charts refer to the intervention group, while the following ones to the control group. For detailed and complete results please consult the attachments chapter, section X.

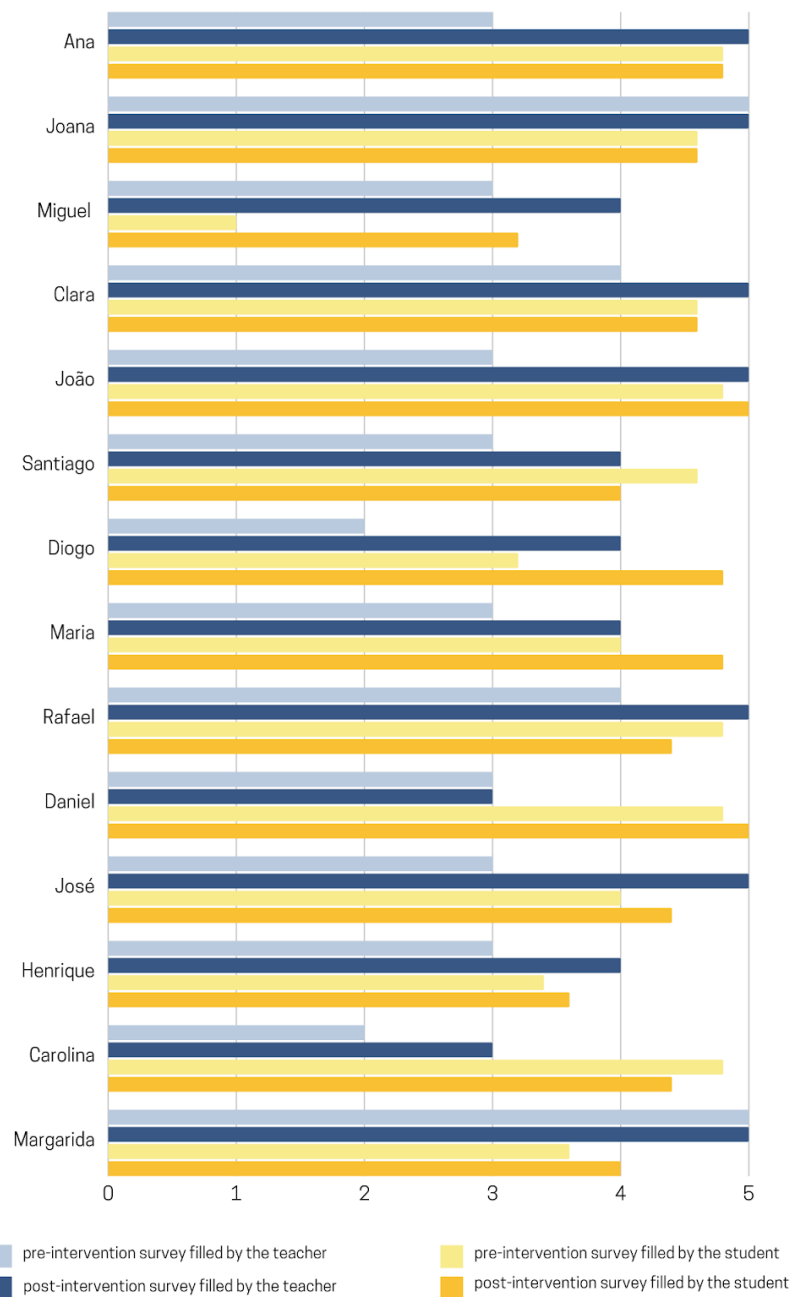


Figure 12, results for teamwork in the intervention group from the student and teacher perspective

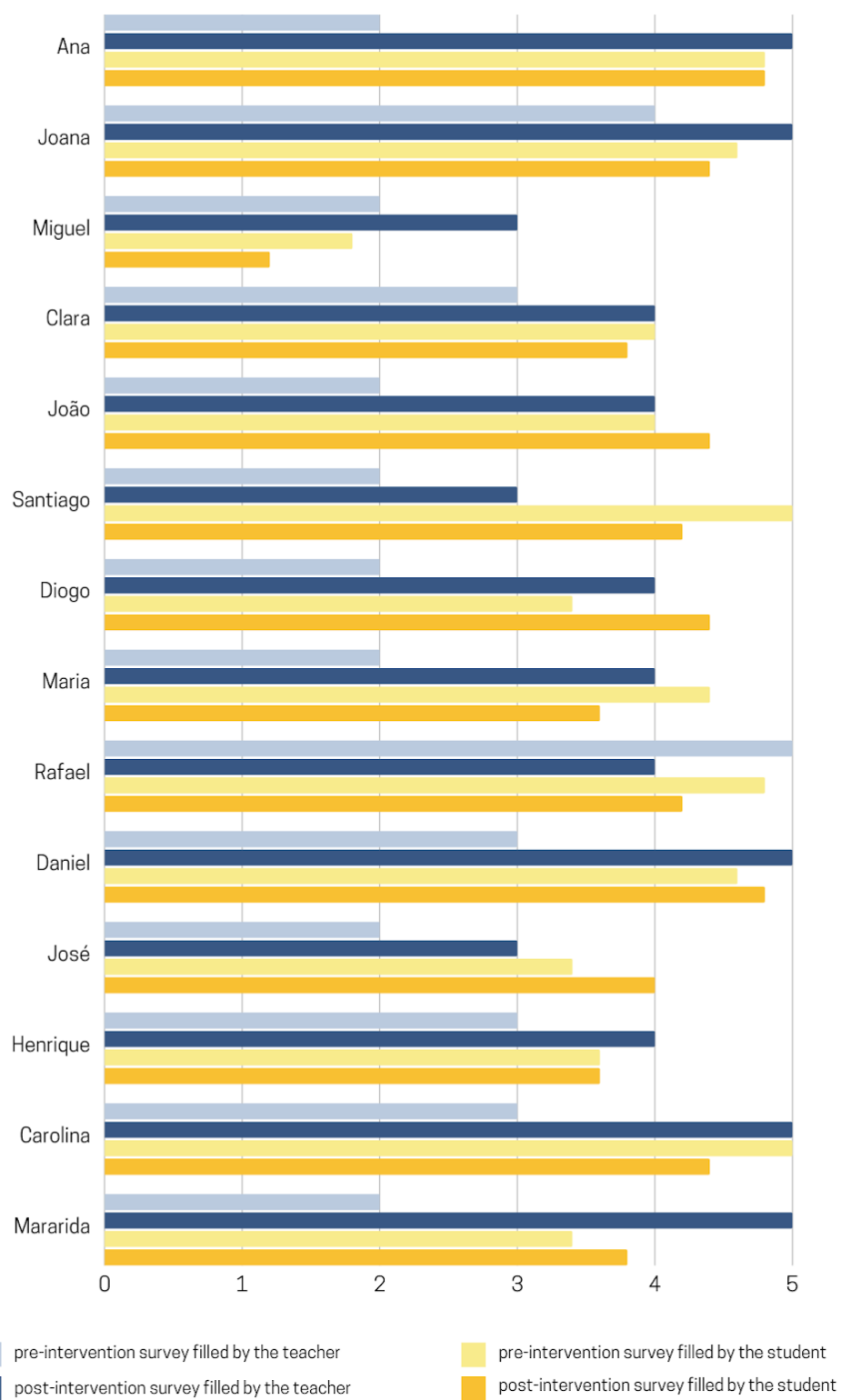


Figure 13, results for creativity and problem-solving in the intervention group from the student and teacher perspective

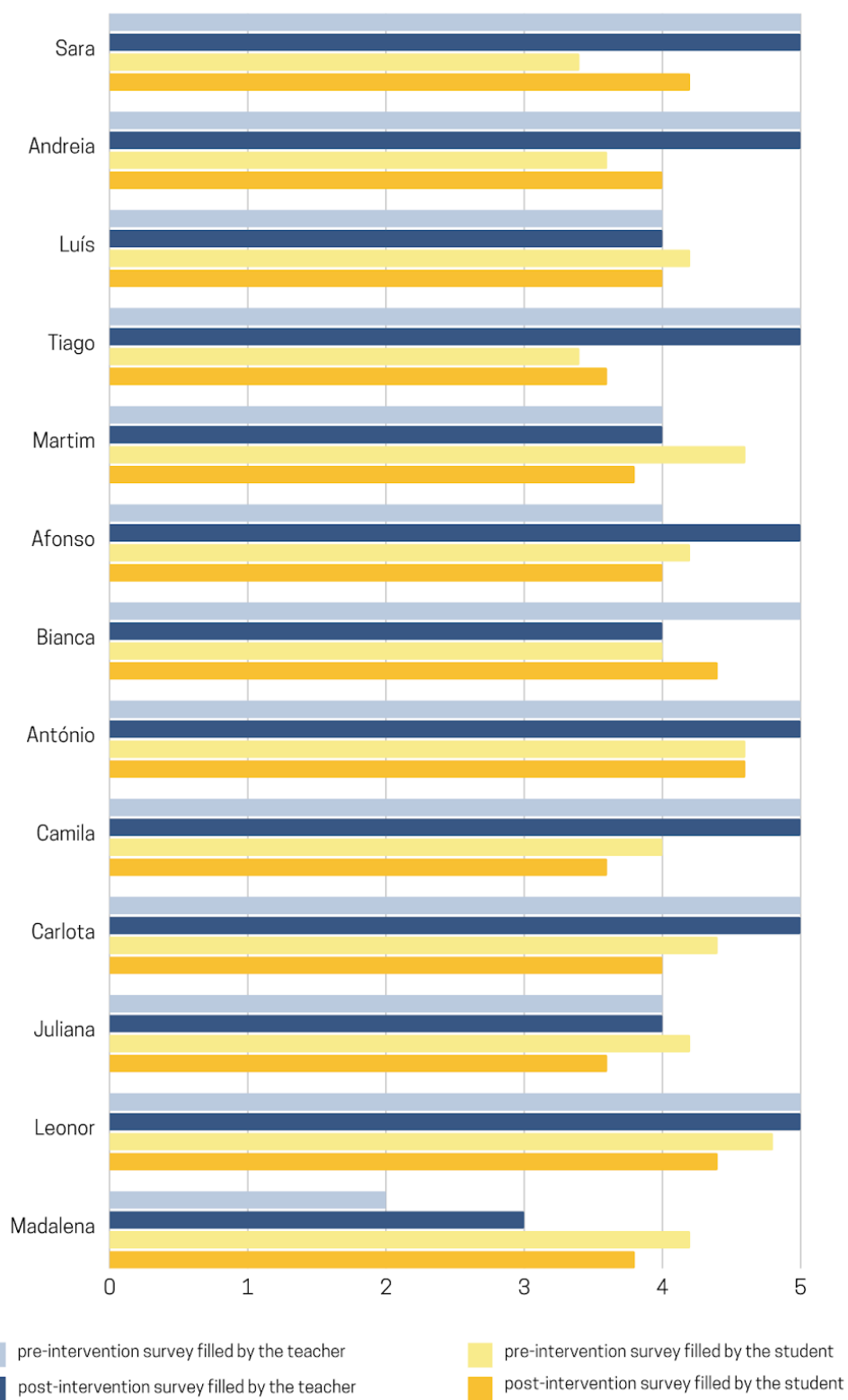


Figure 14, results for teamwork in the control group from the student and teacher perspective

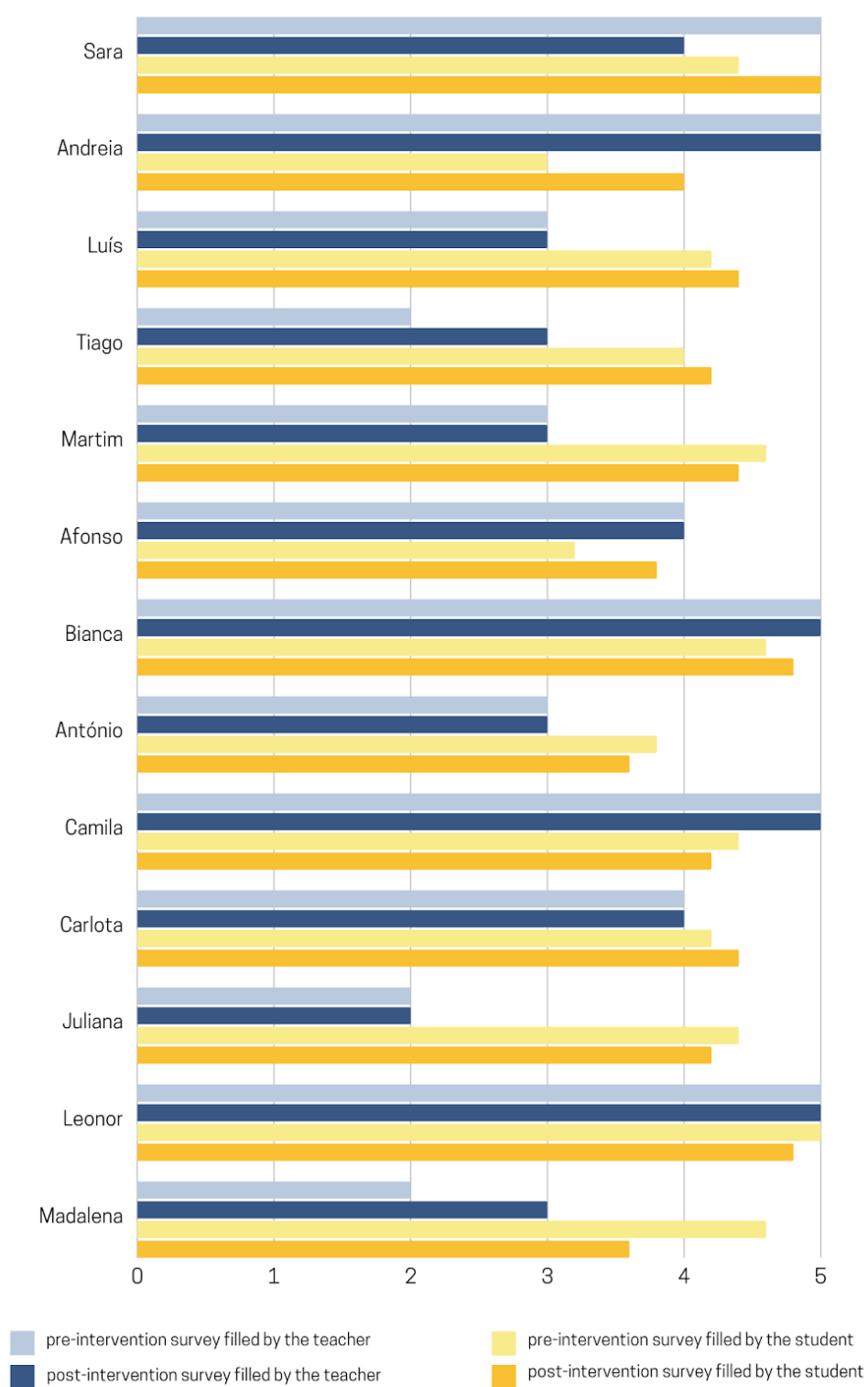


Figure 15, results for creativity and problem-solving in the control group from the student and teacher perspective

5 CHAPTER V – ANALYSIS

Soft skills are proven to be an important factor when it comes to recruitment, and personal development; Technical skills are no longer enough for managers to hire, they are giving extreme importance to soft skills, the real reason why people get fired (Tulgan, 2015). The demand for soft skills increases while their development is neglected. In this chapter it will be analyzed the evolution of soft skills in children when exposed to design thinking methods. These changes will be displayed for both intervention and control group.

5.1 Intervention group

5.1.1 Individual analysis

The table below (Tab. 5) presents the perception of the student and the teacher about the intervention, stressing improvements, declining and non-altered soft skills. Note that the values in brackets are obtained by the difference between the post-intervention survey and the pre-intervention survey:

Student's name	Teacher	Student
Ana	Improved the seven soft skills. Initially evaluated in the first survey with values between 2 and 3; in the after-intervention survey, she has reached the maximum value in every soft skill	Improved one soft skill - leadership (+0.4). Declined four - empathy (-0.2), communication (-1.0), systemic thinking (-0.8), and critical thinking (-1.0). The student maintained teamwork and creativity and problem solving with a value of 4.8

Joana	Improved four soft skills - communication, systemic thinking, creativity and problem-solving, and leadership. Initially evaluated with values between 4 and 5, she improved all the soft skills possible, reaching the maximum value in every one of them	Declined in five soft skills - empathy (-0.2), communication (-0.6), systemic thinking (-0.8), creativity and problem-solving (-0.2) and critical thinking (-0.4). Maintained teamwork with a value of 4.6 and leadership with a value of 4.4
Miguel	Improved six soft skills. teamwork, empathy, communication, systemic thinking, creativity and problem-solving and leadership. The student maintained critical thinking with a value of 3	Improved three soft skills - teamwork (+2.2), systemic thinking (+0.4) and, creativity and problem-solving (+0.2). Declined in other three soft skills, empathy (-0.4), communication (-1.8), and critical thinking (-0.2); the student has not altered leadership, keeping the value of 4.4
Clara	Improved seven soft skills - empathy (+2.0), and the remaining soft skills (+1.0)	Improved three soft skills - empathy and leadership (+0.2), and critical thinking (+0.4). Declined two - systemic thinking (-0.6) and creativity and problem-solving (-0.2). Maintained teamwork with 4.6 and communication with 3.8.
João	Improved seven soft skills - communication (+3.0), teamwork, empathy, systemic thinking and creativity and problem-solving (+2.0), leadership and critical thinking (+1.0)	Improved four soft skills - teamwork (+0.2), communication (+0.6), creativity and problem-solving (+0.4), and leadership (+1.0). Declined two soft skills, empathy and systemic

		thinking (-0.2). Maintained critical thinking with a value of 4.6.
Santiago	Improved four soft skills - teamwork, empathy, communication, and creativity and problem-solving. Empathy was the biggest improvement considering a variation of (+2.0). Systemic and critical thinking were maintained with the value of 3, and leadership with 2	Improved one soft skill - critical thinking (+0.6). Declined six - teamwork (-0.6), empathy, communication, systemic thinking (-0.2), creativity and problem-solving (-0.8) and leadership (-1.0)
Diogo	Improved six soft skills - teamwork, empathy, creativity and problem-solving (+2.0), systemic thinking, leadership, and critical thinking (+1.0). Communication was maintained with a value of 3.	Improved seven soft skills - teamwork and communication (+1.6), empathy and leadership (+0.8), systemic thinking and creativity and problem-solving (+1.0), and critical thinking (+0.6)
Maria	Improved seven soft skills, empathy, creativity and problem-solving, and critical thinking (+2.0), and the remaining soft skills (+1.0)	Improved one soft skill - communication (+0.2); declined six - teamwork (-0.4), empathy (-1.0), creativity and problem-solving, critical thinking (-0.6), systemic thinking and leadership (-0.2)
Rafael	Improved two soft skills - teamwork and empathy (+2.0). Declined five concerning a variation of (-1.0)	Improved one soft skill - communication (+0.2). Declined six - teamwork (-0.4), empathy (-1.0), creativity and problem-solving, and critical thinking (-0.6), and leadership (-0.2)

Daniel	Improved four soft skills - communication, systemic thinking, creativity and problem-solving and, leadership. Declined critical thinking and maintained teamwork and empathy in the value of 3	Improved four soft skills - teamwork, creativity and problem-solving (+0.2), communication (+0.6), and leadership (+0.4). Declined critical thinking (-0.6), and maintained empathy with a value of 4.4 and systemic thinking with 3.8
José	Improved seven soft skills, teamwork and empathy (+2.0), and the remaining soft skills (+1.0)	Improved seven soft skills - empathy, systemic thinking (+0.4), creativity and problem-solving, and leadership (+0.6), critical thinking (+0.6) and communication (+0.2)
Henrique	Improved three soft skills - teamwork, empathy, and creativity and problem-solving (+1.0). Declined communication (-1.0); maintained systemic thinking with a value of 4, leadership and critical thinking in the value of 3	Improved one soft skill - teamwork (+1.0), maintained creativity and problem-solving with a value of 4, declining the remaining ones
Carolina	Improved seven soft skills. The biggest positive variations occurred in communication, creativity and problem-solving, and leadership (+2.0),	Improved zero soft skills. Maintained systemic thinking with a value of 4.2, declining the remaining ones - teamwork and critical thinking (-0.4), empathy (-1.2), communication and creativity and problem-solving (-0.6), and leadership (-1.8)
Margarida	Improved four soft skills - systemic thinking (+1.0), creativity and	Improved three soft skills - teamwork, creativity and problem-

	problem-solving (+3.0), leadership and critical thinking (+2.0). Maintained teamwork and empathy with the maximum value, and declined communication (-1.0)	solving and critical thinking (+0.4), declined three - empathy and communication (-0.2) and systemic thinking (-0.4). Leadership was maintained with the value of 3.4
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Table 5, Student and teacher perception about the intervention

Summarizing the presented analysis, it is possible to conclude that, from fourteen students, twelve have improved, at least, four out of the seven evaluated soft skills, according to the teacher.

5.1.2 Teacher – student transformation

In this context, it will be considered as a transformation the possible changes in soft skills - improvement, decline, or maintenance - independently of the average values. When the teacher says that a certain soft skill improved, the student agrees, so it will be considered a correspondent transformation. For a significative correspondence, the student must match in, at least, four transformations pointed by the teacher. At this criteria, only five of the fourteen children demonstrate significative correspondences. The table below analyses matches and genders:

Gender	Number of students	Significative correspondences
Male	8	5
Female	6	0

Table 6, Relation between genders and significative correspondences with the teacher

Second, by analyzing the survey's averages of each student, it is possible to declare that the children's and teacher's average is closer after the intervention: in fourteen students, nine present a lower average difference when comparing the pre and post-intervention surveys.

5.1.3 Group analysis

There were, at the first moment, 17 students. The students formed three groups of four, and a group of five elements. The first group was composed by three elements who completed the overall project, while the fourth member, only attend to three classes. In the second and third group, all members completed the full intervention. Finally in the fourth group, two members completed the entire process –the third element did not attend the class where post-intervention surveys were applied, and the fourth element was transferred (later substituted by a new student who came in the middle of the intervention). The following table analysis the groups averages:

	Pre-intervention average	Post-intervention average
Group 1	3.6	3.4
Group 2	4.0	4.7
Group 3	3.6	4.1
Group 4	4.4	4.0

Table 7, Groups averages pre and post-intervention

From observation it was noted that there were triggers for children’s interest. The environment changing was the most visible. Going to the “computer’s classroom” and library made them feel excited and interested. Another conscious aspect was brought out from observation was the group dynamics. The most groups, at some point, felt uncomfortable, especially when the empathize and define phase; however, it was at the ideation stage that they were able to talk about the group problems. This was clearly a turning point since their dynamics, in general, visibly improved after their conversations.

5.1.4 Classroom overall

Below, it is represented how each soft skill evolved, from the teacher's and the students' perspective (Fig. 16):

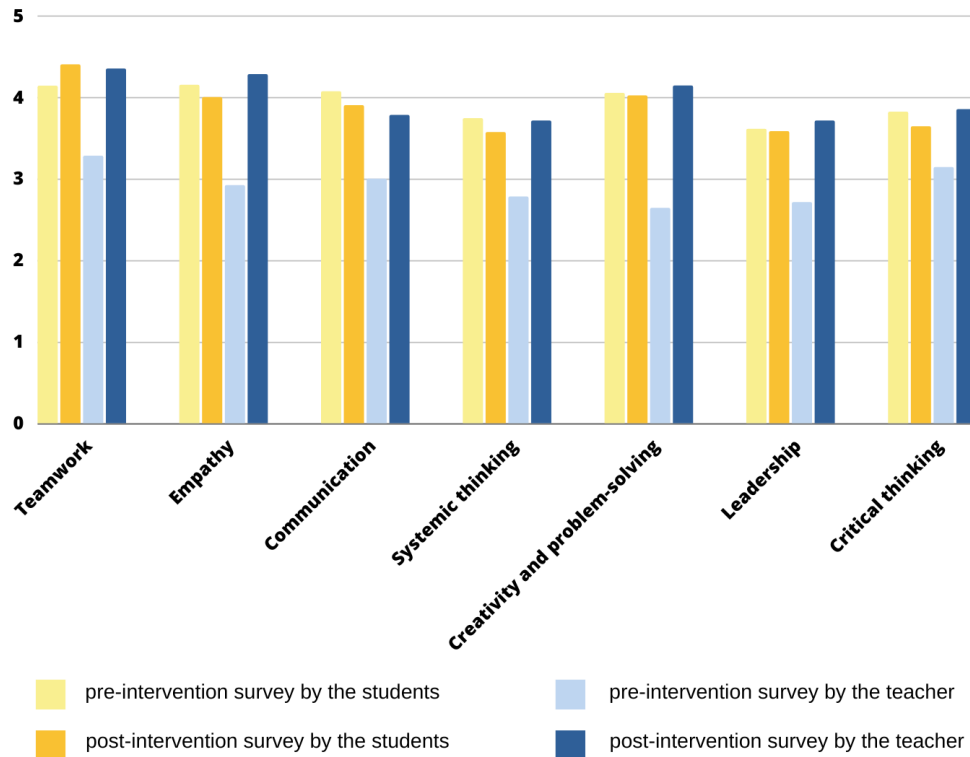


Figure 16, Soft skills evolution in the intervention group

It can be concluded that from the students' point of view, only teamwork has improved, however, according to the teacher, all the evaluated soft skills suffered a positive significative evolution. The biggest improvement happens in creativity and problem-solving. From the teacher's perspective, this soft skill is also, the most improved by the students - thirteen students improve it. On the contrary, the children point out teamwork as the most improved soft skill among them, improved by seven students. In the table below it is possible to observe the number of students who improved each soft skill (Tab. 8):

Soft skill	According to the teacher	According to the student
Teamwork	11 students	7 students
Empathy	11 students	4 students
Communication	10 students	5 students
Systemic Thinking	11 students	3 students
Creativity and Problem-solving	13 students	6 students
Leadership	11 students	6 students
Critical Thinking	8 students	5 students

Table 8, Improved soft skills by students in the intervention group

5.2 Control group

5.2.1 Individual analysis

The table below (Tab. 9) considers the control group, where no intervention happened. Improvements, declining and non-altered soft skills are highlighted. As before, the values in brackets are obtained by the difference between the post-intervention survey and the pre-intervention survey:

Student's name	Teacher	Student
Sara	The students has not improved any soft skill. Declined systemic thinking and creativity and problem-solving (-1.0). Maintained critical thinking at the value of 4, and the remaining soft skills at the maximum value	Improved the seven soft skills - teamwork (+0.8), empathy, critical thinking and creativity and problem-solving (+0.6), communication (+1.2), systemic thinking (+1.4) and leadership (+1.0)
Andreia	Has not improved any soft skill. Maintained leadership ate the value of 4, and the remaining soft skills in the maximum value	Improved six soft skills. Teamwork (+0.4), communication and leadership (+0.6) systemic thinking (+0.8) and creativity and problem-solving (+1.0). Critical thinking was maintained at 3.4
Luís	Improved two soft skills, leadership (+1.0) and critical thinking (+2.0). Maintained creativity and problem-solving as a 3 and the remaining soft skills as 4	Improved three soft skills, empathy (0.6), creativity and problem-solving, and leadership (+0.2). Declined teamwork and communication (-0.2) and systemic thinking (-0.6). Critical thinking was maintained with 3.4
Tiago	Improved two soft skills, systemic thinking, and creativity and problem-solving (+1.0); declined critical thinking (-2.0). Maintained teamwork and empathy in the maximum value, and leadership as 3	Improved three soft skills, teamwork, creativity and problem-solving and leadership (+0.2). Declined communication and critical thinking (-0.2); maintaining empathy at 4.2 and systemic thinking at 3.4
Martim	Improved two soft skills, communication and critical thinking	Improved two soft skills systemic thinking and leadership (+0.2).

	(+1.0). Declined leadership (-1.0) and maintained empathy at the maximum value, teamwork as 4 and creativity and problem-solving as 3	Declined teamwork (-0.8), critical thinking (-0.4), creativity and problem-solving, communication and empathy (-0.2)
Afonso	Improved three soft skills, teamwork, empathy and communication (+1.0), the remaining soft skills were maintained as 4	Improved five soft skills critical thinking (+0.8), leadership, creativity and problem-solving, systemic thinking, and communication (+0.6). Declined teamwork (-0.2), and maintained empathy as 4.4
Bianca	Has not improved any soft skill. Declined empathy (-1.0) and maintained the remaining soft skills at the maximum value	Improved four soft skills, teamwork, and leadership (+0.4), creativity and problem-solving (+0.2), and critical thinking (+0.6). Declined empathy (-0.4),and systemic thinking (-0.6); maintained communication with 4.2
António	Improved one soft skill, communication (+1.0). Maintained teamwork with the maximum value, empathy as 4 and the remaining soft skills as 3	Improved four soft skills, communication and systemic thinking (+0.2), leadership and critical thinking (+0.4). Declined creativity and problem-solving (-0.2), maintaining teamwork and empathy as 4.6
Camila	Has not improved any soft skill. All of them were maintained at the maximum value	Has not improved any soft skill. Maintained communication with 3.8 and leadership with 3.6, declining the remaining soft skills - teamwork and critical thinking (-0.4), empathy,

		creativity and problem-solving (-0.2), and systemic thinking (-0.1).
Carlota	Has not improved any soft skill. Maintained teamwork and empathy in the maximum value; and communication, creativity and problem-solving, and leadership in the value of 4. Declined critical and systemic thinking (-1.0)	Improved four soft skills, communication (+0.6), systemic thinking and leadership (+0.4), and creativity and problem-solving (+0.2). Declined teamwork (-0.4) and critical thinking (-0.2), maintaining empathy as 4.4
Juliana	Has not improved any soft skill. Declined leadership and critical thinking (-1.0), maintaining teamwork and empathy as 4, communication as 3 and systemic thinking and creativity and problem-solving as 2	Has not improved any soft skill. Declined teamwork (-0.6), empathy (-0.8), and creativity and problem-solving (-0.2). Maintained communication and leadership as 2.8, systemic thinking as 2.6, and critical thinking as 3
Leonor	Has not improved any soft skill. Maintained all of them in the maximum value	Improved one soft skill, leadership (+1.0). Declined the remaining ones, teamwork and leadership (-0.4), empathy, systemic thinking, and creativity and problem-solving (-1.0). Maintained communication as 4.6
Madalena	Improved five soft skills, teamwork, communication, creativity and problem-solving (+1.0); leadership and critical thinking (+2.0). Empathy and systemic thinking were maintained as 3	Improved one soft skill, leadership (+0.2). Declined the remaining ones - teamwork (-0.4), empathy and communication (-0.6), systemic thinking (-1.2), creativity and problem-

		solving (-1.0), and critical thinking (-0.2)
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Table 9, Soft skills evolution in the control group

In conclusion, of the thirteen students in the control group, improving at least four soft skills, it was obtained a total of one student. Improving one soft skill, from the teacher's perspective.

5.2.2 Classroom overall

Below, it is represented how each soft skill evolved, from the teacher's and the students' perspective (Fig.17):

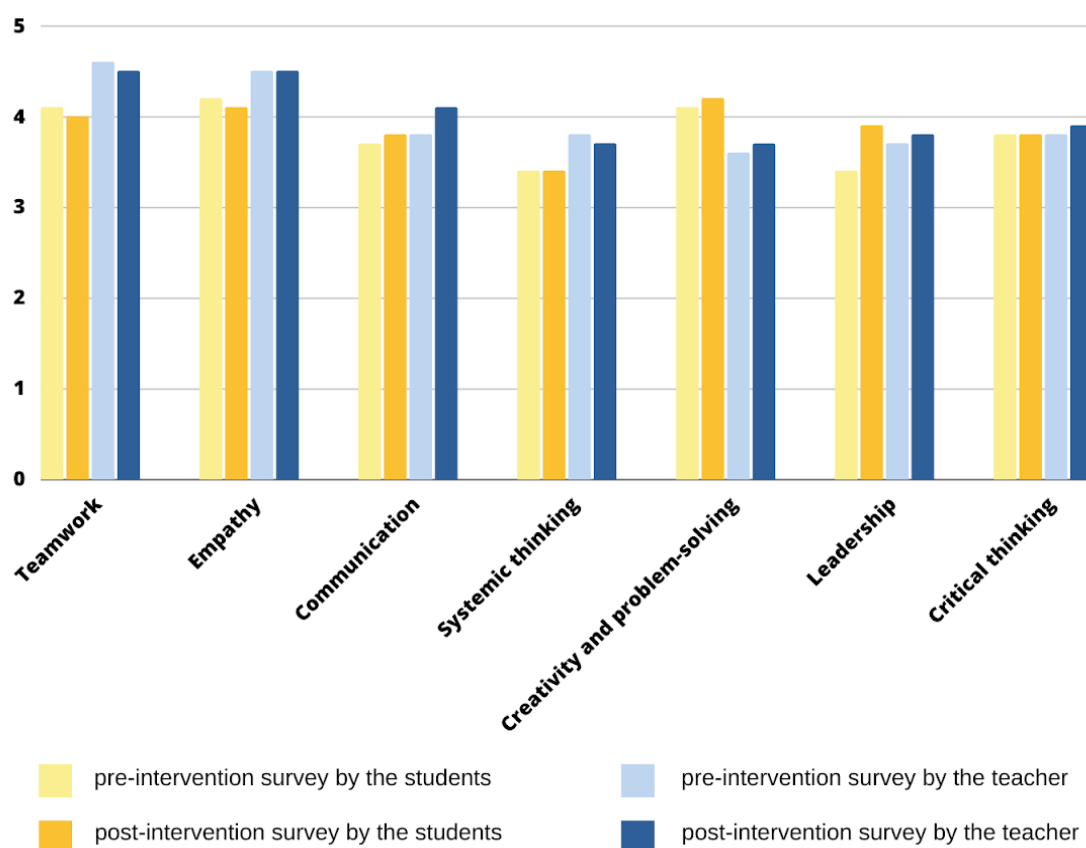


Figure 17, Soft skills evolution in the control group

From the students' perspective, communication, creativity and problem-solving, and leadership have improved. According to the teacher, also critical thinking has a positive variation. It is possible to say that communication, is the most improved soft skill according to the teacher and leadership according to the students. By comparing children's and teacher's average in thirteen students, seven present a lower average difference.

6 CHAPTER VI – DISCUSSION

The children need a way to develop soft skills in order to become individual and professional successful. The presented results suggest that the exposure to design thinking in school context at an early age improves soft skills such as teamwork, empathy, communication, systemic and critical thinking, creativity and problem solving, and leadership.

The intervention group had a notable positive variation in all of the evaluated soft skills, improving all of them, according to the teacher. In students' perspective, only teamwork suffered a positive variation. The educator underlined significantly more improvements than the students, however, after the intervention, the student's perception was closer to the teacher. This might be related to the fact that after the intervention the survey's statement became realer, they could think about their work and process and evaluate themselves.

Also the transformation were analyzed. Transformations are understood as changes in each dimension - when the teacher says that the student has improved, the student agrees, regardless of the rate of change; when the teacher says the student got worse, the student agrees, regardless of the rate of change. It is considered feasible to match transformations in 4 or more evaluated soft skills. In 6 females, there were no viable correspondences; from 8 males, there were five. Only one student fully matches the transformations underlined by the teacher – José. One interesting aspect that emerged from the analysis of the group's averages. The groups that suffer alterations or absence of elements show a decrease (group 1 and 4), while the groups whose elements remained throughout the entire intervention show improvements (group 2 and 3).

From observations is possible to conclude that (1) changing the classroom environment can stimulating the interest and motivation for learning; (2) ideation was turning point for the groups

dynamics; this might due to the fact that it is the stage where more discussion and participation is needed.

In the control group, according to the teacher, a reduced number of soft skills were improved – communication, creativity and problem solving, leadership, and critical thinking. Even so, the students pointed out that the same amount of improved soft skills – systemic thinking, creativity and problem solving, leadership and critical thinking. As the previous group, the children's results also do not match with teacher's, however, in this group, the students point out more improvements than the teacher.

Comparing both groups, from the teacher's perspective, in the intervention group all of the soft skills were improved by the students, while in the control group, only four of them had a positive variation. This way, the results contributed to a clearer understanding of the benefits of a design thinking intervention as a soft skills promoter.

The study is also aligned with a few researchers. The working themes were part of the curriculum. By applying design thinking methods, the students solved real-world problems. The first group, who worked with children exploitation intended to organized a school material campaigned, the second group, gender equality suggests classes and workshops for the theme awareness; the third group, sustainability, propose the organization of walks in the beach were the goal was to collect waste so they can fight sea pollution; and the final group, bullying, "solved" the problem by creating activities that encompass the victim and the bully, so they could bond and become friends. These results are aligned with Chakraborty (2022), who prompts that learn by doing is an approach that can be adopted by the parents or the teacher to teach the basics of soft skills. Similar conclusions were drawn by Noel and Liub, who prompt that "The parallel between these skills and the skills imparted through Design Thinking and Design education seem to suggest a significant opportunity for a new design-based education paradigm that focuses on design abductive reasoning and cognitive skills like curiosity, innovation and critical thinking as well as the development of social skills such as empathy, facilitation and collaboration." (Noel & Liub, 2017, p. 10); and Carrol, who suggest that design thinking is a tool capable of supporting students' academic performance by contributing to the development of critical thinking, teamwork skills and social abilities (Carroll et al., 2010).

In summary, this study has proven to be a solution for the lack of soft skills development in younger generations. By integrating design thinking at an early age school program, the needed soft skills for today's society could be successfully developed.

7 CHAPTER VII – CONCLUSION

This dissertation aimed to answer the following question:

- can a design thinking intervention in school context promote the development of soft skills in children?

Based on qualitative and quantitative it can be concluded that a design thinking intervention in school context promotes the development of soft skills in children. The results indicate that all of the students who participated in the intervention improved at least one soft skill. This intervention also proves that it is possible to develop soft skills through a problem-based approach and revealing that design thinking is a powerful tool for learning and engaging activities.

Soft skills proved to be tremendously important to managers and recruiters. Nowadays, the gap between their expectations and reality is increasing (Tulgan, 2015). This means that somewhere in the journey, as children, adolescents, or young adults, they should be learning the basics. Chakraborty (2022) defends that in order to properly cultivate soft skills, they must be introduced and practiced from an early age, that way they will grow involved in that principles and values. These ideas motivate the choice of the ages to work with. By conducting the intervention in the 5-grade, children had from nine to eleven-year-old, meaning that they had the core abilities to the project – know how to read and write, how to express, and how to interact. From this point, it is possible to develop the required soft skills.

7.1 Study limitations

The small number of participants – fourteen students in the intervention group – do not reflect the educational paradigm nor the total validation of the intervention as a promoter of the development of these skills. Results might vary depending on the application context, culture, and environment. The second identified limitation was the available time for the study; the design thinking process had to fit in ten classes of forty-five minutes, so the intervention tools and methods had to be adapted. The control and intervention groups, even at the same municipal, were from different schools, and therefore, evaluated by different teachers. Finally, during the intervention, one student was transferred, and a new student came to the class; besides, a different student only showed up at three classes. Since the students worked in small groups, these events affect their dynamics.

7.2 Future research

In the development of this investigation some questions were raised, (1) can a design thinking intervention promote self-knowledge? (2) Do male children possess more auto-perception than female children? (3) Will the improved skills be maintained through their academic life?

Further research should consider the need to empower children and adolescents with these skills, giving them the opportunity to fail and improve. Teachers should be aware of the importance of these competencies in children's personal and future professional development, developing strategies to promote them.

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APPENDIX

Section I – Intervention design

The intervention was planned in the following terms – the first two classes, 24 November, and 15 December were destined to the pre-intervention survey, group formation, themes distribution. The next ten classes were occupied by the intervention, from 5 January to 23 March; and finally on 29 March the post-intervention survey was conducted.



Figure 1, Model created to the empathize stage and filled by each group – 5 January

At this stage the students had to answer four questions using their knowledge and online resources – (1) what is it?, (2) why is it a problem, (3) what impacts? and (4) where does it happens



Figure 2, Model created to the defined stage and filled by each group (front and back) – 12 January

By filling this model, the students were able to form their initial problem statement. The first answered to three questions – “What is the problem?”; “who does this problems affects?”; and “what is the bigger consequence”. Turning the page around, they could place the post-its in the correspondent places and fill the blank spaces in the sentence: ___(The user)___ need a way to ___(the problem)___ because ___(insight)___.

With an initial problem statement, the students began the ideation stage, which lasted for two lessons. The “Pizza Challenge” was conducted. In the first lesson they had an individual exercise, thinking about possible ideas to solve their problems:

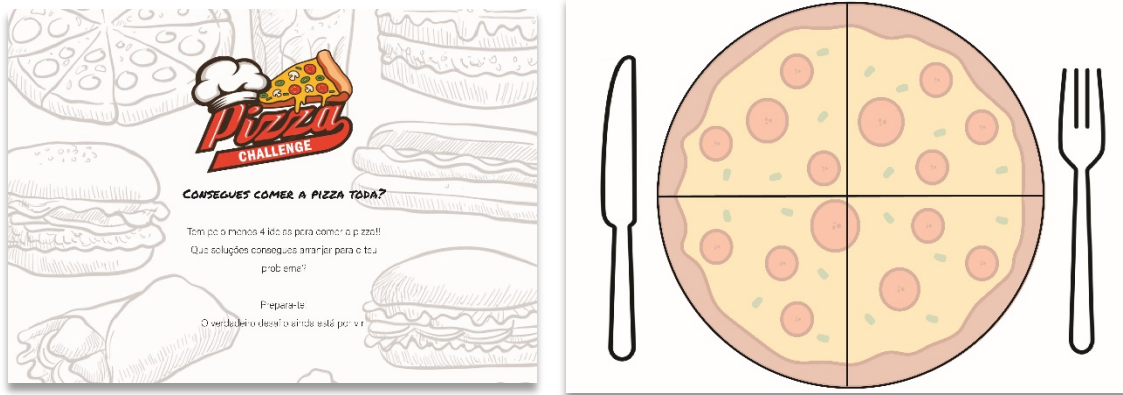


Figure 3, Model created to the individual ideation stage (frontand back²) – 19 January

In the second lesson they must discuss their ideas and construct the group’s pizza. They had to choose the best four ideas, and organize them into a prioritization matrix settled by effort and impact, choosing the idea that thy were about to prototype.



Figure 4, Model created to the group ideation stage – 26 January

² Can you eat the entire pizza? / You need to have at least four ideas to eat the whole pizza! / What solutions can you find to solve your problem? / Get ready, the challenge is coming!

The students choose their “final” idea and started to prototype. They first fill the column at right, in the first box they attached the post it with the chosen idea, in the next one they should indicate if they prototype would be a product, a service or an ux/ui project, and finally a hint was given: “think about something that you would use”. After, they should make their idea tangible, so they were encouraged to make a quick representation of it

UMA VIAGEM AO FUTURO!
FAZ UM DESENHO RÁPIDO DA TUA FUTURA SOLUÇÃO!

COLEM AQUI A IDEIA QUE DECIDIRAM PROTOTIPAR

VAMOS PROTOTIPAR UM:

☐ PRODUTO
☐ UX/UI
☐ SERVIÇO


DICA: PENSEM EM ALGO QUE VOCÊS FARIAM OU UTILIZARIAM

Figure 5, Model created to the prototype stage – 9 February

For the last stage – test – they must present their ideas to other people, asking for feedback. In this case, the 7th grade. The next two classes were destined the feedback idea. In the first one, they thought about which questions they wanted to ask (February 16), and in the following lesson they presented their solutions (February 23). March 9, they applied the given feedback and made the final adjusts to their work.

TESTAR A NOSSA SOLUÇÃO!

PROBLEMA 	QUE PERGUNTAS VOU FAZER?
SOLUÇÃO 	

Figure 6, Model created to the test stage: planning questions – 16 February

They wrote the given insights in this model:

TESTAR A NOSSA SOLUÇÃO!

 O QUE DIZEM	 O QUE SENTEM
---	--

Figure 7, Model created to the test stage: insight – 16 February

In the last two lessons the final presentation was prepared. They watched a video about what to do and not to do in an oral presentation, and a hint guide was given to each student:



Figure 8, Hint model created for oral presentation – 16 March

It had seven hints: (1) be direct and objective; (2) do not just read; (3) do not be a statue or a dancer; (4) speak clearly; (5) practice! You will feel secure; (6) when you are talking, look to you public; and finally (7) relax, and have fun!

Support card were also made for each group, according to the number of members. Each member should choose their card, answers to its questions, and follow given order. March 23 they presented their work, and in the following lesson the post-intervention surveys were applied.



Figure 9, Model created for oral presentation support: group 1 – 16 March



Figure 10, Model created for oral presentation support: group 2 – 16 March



Figure 11, Model created for oral presentation support: group 3 – 16 March



Figure 12, Model created for oral presentation support: group 4 – 16 March

Section II – Children’s surveys

Nome_____

Data___/___/___

As afirmações que se seguem dizem respeito à tua percepção sobre ti, numa variedade de situações. Por favor, indica até que ponto concordas com cada afirmação utilizando a seguinte escala:

1. Discordo totalmente
2. Discordo
3. Nem concordo nem discordo
4. Concordo
5. Concordo completamente

Não há respostas certas ou erradas; considera cada afirmação cuidadosamente e seleciona o número que melhor reflete a tua pessoa. Descreve-te como és agora, não como gostarias de ser no futuro.

1. Respeito os membros do grupo

	1	2	3	4	5	
Discordo totalmente	☐	☐	☐	☐	☐	Concordo completamente

2. Sou compreensivo/a

	1	2	3	4	5	
Discordo totalmente	☐	☐	☐	☐	☐	Concordo completamente

3. Os meus colegas entendem-me facilmente

	1	2	3	4	5	
Discordo totalmente	☐	☐	☐	☐	☐	Concordo completamente

4. Consigo resumir informação

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

5. Procuro ter novas ideias

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

6. Quando trabalho em grupo, sou eu que distribuo as tarefas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

7. Aceito facilmente críticas em relação ao meu trabalho

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

8. Valorizo a colaboração de todos os elementos

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

9. Coloco-me no lugar dos outros e tento compreendê-los

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

10. Partilho as minhas opiniões

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

11. Quando estou a ler um texto, identifico as ideias principais

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

12. Sou curioso/a

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

13. Percebo quais as tarefas que têm de ser realizadas em primeiro lugar

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

14. Reconheço quando preciso de melhorar

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

15. Partilho o meu conhecimento

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

16. Ouço e observo de forma a entender sentimentos ou preocupações

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

17. Defendo os meus pontos de vista

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

18. Relaciono ideias, estabelecendo ligações entre elas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

19. Esforço-me para encontrar soluções para os meus problemas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

20. Tenho iniciativa

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

21. Detecto inconsistências e apresento alternativas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

22. Trabalho com diferentes pessoas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

23. Consigo perceber quando um colega não está bem, mesmo que ele/ela não o diga

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

24. Respeito diferentes pontos de vista

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

25. Quando tomo uma decisão, analiso os prós e contras, e só depois faço a decisão final

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

26. Tenho uma imaginação fértil

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

27. Não sou facilmente influenciável

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

28. Converso com pessoas fora da escola/ de outros grupos sobre o trabalho que estou a desenvolver

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

29. Colaboro, tentando encontrar uma solução para um problema

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

30. Trato os outros como gosto que me tratem a mim

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

31. Apresento bons argumentos para defender as minhas opiniões

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

32. Não sou impulsivo

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

33. Consigo relacionar ideias diferentes

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

19. Esforço-me para encontrar soluções para os meus problemas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

20. Tenho iniciativa

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

21. Detecto inconsistências e apresento alternativas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

22. Trabalho com diferentes pessoas

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

23. Consigo perceber quando um colega não está bem, mesmo que ele/ela não o diga

Discordo totalmente 1 2 3 4 5 Concordo completamente

☐ ☐ ☐ ☐ ☐

34. Consigo motivar os membros do meu grupo

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

35. Considero críticas para apresentar o melhor trabalho possível

1 2 3 4 5
Discordo totalmente ☐ ☐ ☐ ☐ ☐ Concordo completamente

OBRIGADA!!!

Section III – Teacher’s surveys

Nome da criança: _____

Trabalho de equipa: Consigo trabalhar em diferentes equipas, colaborando e respeitando os membros do grupo de forma a chegar à melhor solução possível para o problema que estamos a resolver.

- Respeito os membros do grupo
- Valorizo a colaboração de todos os elementos
- Partilho o meu conhecimento
- Trabalho com diferentes pessoas
- Colaboro, tentando encontrar uma solução para um problema

☐

Empatia: Coloco-me no lugar do outro, tentando perceber diferentes perspetivas, comportamentos, motivações e preocupações

- Sou compreensivo/a
- Coloco-me no lugar dos outros e tento compreendê-los
- Ouço e observo de forma a entender sentimentos ou preocupações
- Consigo perceber quando um colega não está bem, mesmo que ele/ela não o diga
- Trato os outros como gosto que me tratem a mim

☐

Comunicação

Comunico de forma clara e objetiva conseguindo assim transmitir ideias e opiniões.

- Os meus colegas entendem-me facilmente
- Partilho as minhas opiniões
- Defendo os meus pontos de vista
- Respeito diferentes pontos de vista
- Apresento bons argumentos para defender as minhas opiniões

☐

Pensamento sistémico

Tenho a capacidade de analisar e sintetizar informação, percebendo e interpretando padrões.

- Consigo resumir informação
- Quando estou a ler um texto, identifico as ideias principais
- Relaciono ideias, estabelecendo ligações entre elas
- Quando tomo uma decisão, analiso os prós e contras, e só depois faço a decisão final
- Não sou impulsivo

☐

Criatividade/ Resolução de problemas

Tento encontrar formas diferentes de fazer coisas habituais. Penso fora da caixa e procuro soluções inovadoras para os meus problemas.

- Procuro ter novas ideias
- Sou curioso
- Esforço-me para encontrar soluções para os meus problemas
- Tenho uma imaginação fértil
- Consigo relacionar ideias diferentes

Liderança

Consigo delegar tarefas, organizar o meu trabalho e estabelecer prioridades.

- Quando trabalho em grupo, sou eu que distribuo as tarefas
- Percebo quais as tarefas que têm de ser realizadas em primeiro lugar
- Tenho iniciativa
- Não sou facilmente influenciável
- Consigo motivar os membros do meu grupo

Pensamento crítico

Tenho a capacidade de criticar o meu próprio trabalho e sei reconhecer quando tenho de melhorar.

- Aceito facilmente críticas em relação ao meu trabalho
- Reconheço quando preciso de melhorar
- Deteto inconsistências e apresento alternativas
- Converso com pessoas fora da escola/ de outros grupos sobre o trabalho que estou a desenvolver
- Considero críticas para apresentar o melhor trabalho possível

Note that the color blue represents the surveys filled by the students, white blue for the pre-intervention surveys, dark blue for post-intervention surveys. The color yellow is associated with the teacher, white yellow for the pre-intervention surveys and dark yellow for the post-intervention surveys.

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Miguel				Clara				João				Santiago			
1	3,2	3	4	4,6	4,6	4	5	4,8	5	3	5	4,6	4	3	4
1	4			5	5			5	5			5	5		
1	1			5	5			5	5			5	4		
1	1			4	4			4	5			4	4		
1	5			4	4			5	5			4	3		
1	5			5	5			5	5			5	4		
2,8	2,4	2	4	4,4	4,6	3	5	4,6	4,4	3	5	3,8	3,6	2	4
2	1			4	4			5	4			5	4		
1	5			4	5			4	5			5	4		
5	1			4	5			5	5			4	4		
1	4			5	4			4	4			4	4		
3	1,2	2	3	3,8	3,8	3	4	4,2	4,8	2	5	4,8	4,6	2	3
3	1			3	4			4	5			5	5		
5	1			4	4			5	5			4	5		
1	1			4	4			4	5			5	5		
5	1			4	3			4	5			5	5		
1	2			4	4			4	4			5	4		
1,2	1,6	2	3	4,4	3,8	3	4	4	3,8	2	4	4,4	4,2	3	3
1	2			4	3			5	5			5	5		
2	1			5	4			4	4			4	4		
1	1			5	4			3	5			4	4		
1	2			4	4			4	4			5	4		
1	2			4	4			4	1			4	4		
1,8	2	2	3	4	3,8	3	4	4	4,4	2	4	5	4,2	2	3
2	1			4	5			4	4			5	4		
4	1			4	3			3	2			5	5		
4	1			4	4			4	5			5	4		
1	1			4	4			4	5			5	4		
1	2			4	4			5	5			5	4		
1	5			3,4	3,6	3	4	3,2	4,2	3	4	4,6	3,6	2	2
2	2	2	3	2	3			3	3			4	3		
1	1			4	3			4	4			4	5		
1	5			4	3			4	4			5	5		
2	1			4	3			4	4			5	5		
5	1			3	4			4	5			4	5		
1	1			5	5			4	4			5	5		
1	1			2	2			5	5			5	1		
1	4			4	4			4	4			2	5		

Diogo				Maria				Rafael				Daniel			
3,2	4,8	2	4	5	4,8	3	4	4,8	4,4	4	5	4,8	5	3	3
3	5			5	5			5	4		5	5	5		
4	5			5	5			5	4		5	5	5		
4	5			5	5			4	5		5	5	5		
2	5			5	5			5	5		5	5	5		
3	4			5	4			5	4		4	5	5		
3,4	4,2	2	4	4,4	4,8	2	4	4,8	3,8	4	4,4	4,4	3		3
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3	4,6	3	3	4,8	4	2	3	4,4	4,6	5	4	3,8	4,4	3	4
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3	5			5	4			5	5		3	5	4		
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2	3			4	4			4	5		4	4	3		
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3	4			5	4			5	4		4	4	4		
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3	5			4	1			5	3		4	4	4		
3	5			5	4			4	4		5	5	5		
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3	3			5	1			4	3		5	5	5		
3	4			5	5			5	5		5	4			

As before, the color blue represents the surveys filled by the students, white blue for the pre-intervention surveys, dark blue for post-intervention surveys. The color yellow is associated with the teacher, white yellow for the pre-intervention surveys and dark yellow for the post-intervention surveys.

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Luís				Tiago				Martim				Afonso			
4,2	4	4	4	3,4	3,6	5	5	4,6	3,8	4	4	4,2	4	4	5
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4	4			3	4			5	5			2	4		
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Bianca					Antonio					Camila					Carlota				
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4,6	4,8	5	5		2	3,6	3	3		4,4	4,2	5	5		4,2	4,4	4	4	
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4	4				3	4				3	4				4	4			

Juliana				Leonor				Madalena			
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4	3			5	5			5	3		
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2,8	2,8	3	2	3,6	4,6	5	5	3,6	3,8	1	3
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1	3			1	4			1	5		
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