TIPS Social Skills Curriculum

Content

Indhold

1.Introduction

Autism is a lifelong developmental condition that impacts a person's behaviours, communications, learning and interactions, and how they experience the world. it's a congenital condition, and it lasts throughout their life. Every Autistic person is different from each other. Two children, both with the same diagnosis, can act very differently from one another and have varying skills. Their specific challenges and needs are different as well. This is why autism is described as a 'spectrum'. The outlook for many individuals with autism spectrum disorder today is brighter than it was 50 years ago; more people with the condition are able to speak, read, and live in the community rather than in institutions, and some will be largely free from symptoms of the disorder by adulthood. Nevertheless, most individuals will not work full-time or live independently.

Genetics and neuroscience have identified intriguing patterns of risk, but without much practical benefit yet. Considerable work is still needed to understand how and when behavioural and medical treatments can be effective. The risk from gene variants combined with environmental risk factors, such as parental age, birth complications, and others that have not been identified, determine an individual's risk of developing this complex condition. Autistic Syndrome Disorder (ASD) tends to run in families, but the inheritance pattern is usually unknown. People with gene changes associated with ASD, generally inherit an increased risk of developing the condition, rather than the condition itself.

It is now widely acknowledged that the forms of treatment with the most empirical validation for effectiveness with individuals with ASD are those treatments based on a behavioural model. A multitude of research articles document the effectiveness of different therapies like ABA (Applied Behaviour Analysis) or RIT (Reciprocal Imitation Training). These interventions apply the behavioural teaching principles of applied behaviour analysis within the child's natural environment, comprehensive and skill-based methods for teaching a variety of skills in communicating, interacting with adults and peers, playing and engaging in activities, performing self-help skills and tasks, and regulating challenging behaviour. In the last few years there has been an increase in the amount of empirical investigations, evaluating different intervention strategies to improve social behaviour for individuals diagnosed with autism. These strategies include video modelling, peer imitation, social stories, and pivotal response training.

In this context of research and advances, new models emerge. One such intervention, which has a considerable history within the practice domain of applied behaviour analysis, but has just recently gained more attention with respect to autism intervention, is the Teaching Interaction Procedure (TIP). The Teaching Interaction Procedure is a multi-step, systematic approach that has been used to teach a variety of skills for individuals diagnosed with autism spectrum disorder; however, this project focuses on the use of the Teaching Interaction Procedure to improve social skills. The Teaching Interaction Procedure consists of labelling the targeted skill, providing a meaningful rationale for the importance of the skill, describing the steps of the targeted skill, modelling the skill, and providing feedback throughout the interaction. Considering this information, TIPS project aims to improve the life and personal skills of children with autism and their families. Therefore, considering how important learning social and life skills from an early age is, we propose a project for children with ASD to achieve this goal by using two digital tools; a digital game and a digital comic   strip.
We have chosen these digital tools because it has been proved that gamification is a powerful resource to

increase motivation and engage participants. Thus, favouring the teaching learning process or training for specific situations. Designing elements of serious games and/or gamified interfaces often include storylines, mid-term and long-term goals, increasing level of difficulty, feedback and/or rewards, and provision of choice. Recent studies suggest improvements in handling disorder-related symptoms through the use of serious games or gamified interventions. Gamification may be a potentially effective approach due to the high visual processing skills the ASD individuals possess.

As autistic people reportedly enjoy engaging with digital media, it is not surprising that many game-based interventions rely on computerized technology. Digital games offer several advantages, including performance tracking, more effortless customization and visual engagement.

Comic strips are also a good tool to work with autistic people. Perhaps the most well-known use of comics within the autistic community, is that of social stories. Created in 1991, by Carol Gray. Social stories are an important communication tool for people on the spectrum, which can help with everything from preparing an autistic person for an upcoming event, to something more straightforward, like how and why we brush our teeth.

For these reasons digital games and comic strips may also be particularly useful to professionals and parents.

2. Understanding Autism Spectrum Disorder (ASD)

"Autism spectrum disorder" (ASD), has evolved after continual substantial developments taking place over more than a century. The name was adopted in 2013, and by DSM -5 is defined as a complex developmental condition that involves persistent challenges in social interaction, speech and nonverbal communication, and restricted/repetitive behaviours. The effects of ASD and the severity of symptoms are different in each person.

Two official manuals, the "Diagnostic and Statistical Manual of Mental Disorders" (DSM) (published by the American Psychiatric Association), and the "International Classification of Diseases" (ICD) (published by the World Health Organization) is being regularly updated to facilitate diagnosis of ASD. ICD-11 guidelines being prospectively implemented with effect from January 2022 have attracted global attention.

From the history of autism, there are two important persons who defined first cases of autism. One of them is Dr. Leo Kanner, who published the first clinical research on autism spectrum disorder in 1943, where he described a group of 11 children – eight boys and three girls – who had "autistic disturbances of affective contact" (Kanner, 1943). The other one is Hans Asperger, an Austrian paediatrician, who was working at nearly the same time as Kanner with a similar group of children with a milder form of autism, Asperger syndrome. Asperger described this syndrome in 1944, one year after Leo Kanner published his iconic article on autism, he presented case studies, just as Kanner had, about "a particularly interesting and highly recognizable type of child" (Nieminen-von Wendt, 2004).

ASD is usually first diagnosed in childhood with many of the most-obvious signs presenting around 2-3 years old, but some children with autism develop normally until toddlerhood when they stop acquiring or lose previously gained skills. Autism is three to four times more common in boys than in girls, and many girls with ASD exhibit less obvious signs compared to boys.

Research from 2021 showed a lot of reports about masking the symptoms in girls with ASD. They suggest that for autistic females, motivations to camouflage autism may include **an increased need to meet societal expectations and feelings of isolation that accompany difficulties with**

maintaining friendships. Autism is a lifelong condition. However, many children diagnosed with ASD go on to live independent, productive, and fulfilling lives.

There is a great range of abilities and characteristics of children with autism spectrum disorder — no two children appear or behave the same way. Autism differs from person to person in severity and combinations of symptoms. Symptoms can range from mild to severe and often change over time. Characteristics of autism spectrum disorder (According to DSM-5 Autism Diagnostic Criteria from 2013) fall into two categories:

- **Social interaction and communication problems:** including difficulties in normal back-and-forth conversation, reduced sharing of interests or emotions, challenges in understanding or responding to social cues such as eye contact and facial expressions, deficits in developing/maintaining/understanding relationships (trouble making friends), and others (APA, 2013).

- **Restricted and repetitive patterns of behaviours, interests or activities:** Hand-flapping and toe-walking, playing with toys in an uncommon way (such as lining up cars or flipping objects), speaking in a unique way (such as using odd patterns or pitches in speaking or "scripting" from favourite shows), having significant need for a predictable routine or structure, exhibiting intense interests in activities that are uncommon for a similarly aged child, experiencing the sensory aspects of the world in an unusual or extreme way (such as indifference to pain/temperature, excessive smelling/touching of objects, fascination with lights and movement, being overwhelmed with loud noises, etc), and others.
    - Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities or may be masked by learned strategies in later life).
    - Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.
    - These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

When diagnosing autism, the following should be considered: Individuals with a well-established DSM-IV diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified should be given the diagnosis of autism spectrum disorder. Individuals who have marked deficits in social communication, but whose symptoms do not otherwise meet criteria for autism spectrum disorder, should be evaluated for social (pragmatic) communication disorder.

Also, during the diagnosis, it is necessary to state whether the condition of the child is accompanied by: intellectual impairment, language impairment, another neurodevelopmental, mental, or behavioural disorder, catatonia, known medical or genetic condition or environmental factors (APA, 2013).

In the last diagnostic classification of autism (DSM-5), the level of severity in social communication and restrictive and repetitive behaviour are considered, where the child may belong to:

- Level 3 - **"Requiring very substantial support"**

Social communication: Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches;

Restricted, repetitive behaviours: Inflexibility of behaviour, extreme difficulty coping with change, or other restricted/repetitive behaviours markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action (APA, 2013).

- Level 2 - **"Requiring substantial support"**

Social communication: Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with support in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and who has markedly odd nonverbal communication.

Restricted, repetitive behaviour: Inflexibility of behaviour, difficulty coping with change, or other restricted/repetitive behaviours appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action (APA, 2013).

- Level 1 - **"Requiring support"**

Social communication: Without support in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose reciprocal conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.

Restricted, repetitive behaviour: Inflexibility of behaviour causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning that hamper independence (APA, 2013).

For deeper understanding of how individuals with autism might experience the world, and respond in the way that they do when they have autism or related support needs, we need to read and get familiar with **cognitive theories**. They can help us to think 'why' challenges might happen and then how we might best make adaptations for autistic individuals, which reduce anxiety and support participation and learning. All of the 'behaviours' in the diagnostic criteria can also occur in individuals without autism. The theories overlap and are not mutually exclusive but each of them has a useful contribution to understanding people with autism (Silberman, 2015). People with autism struggle with these cognitive theories, and that's why sometimes they can't understand neurotypical persons and can be misunderstood.

Theory of Mind

Theory of Mind (ToM) is based on the theory of cognitive processes that are used to understand other people's thoughts, feelings, beliefs and experiences. It was first described by Uta Frith in 1989 and since then our understanding of it has developed considerably. This skill is underpinned by early joint attention (two people focusing on the same thing for the purpose of interacting with one another). ToM continues to develop into adulthood, as we continue to try to understand other people's perspectives and actions in social settings. Typically developing children develop awareness of ToM around the age of 5 and can understand and use words which show they recognize that other people have thoughts, feelings, beliefs, perspectives and experiences which are different to their own. As

children get older they realize that people can think one thing but say another and that there are non-literal interpretations to things people say. This can be conveyed verbally and non-verbally and through prosody (or intonation, pitch and stress in the voice), sarcasm, white lies and jokes. In people with autism ToM may not develop in the same way, which can lead to difficulties in using and understanding social communication, being over-literal, misinterpretations of what others think and say, appearing rude or saying and doing things unexpected to others, and having difficulty imaging how else they could do things in future (Fletcher-Watson et al., 2014). Rather than focussing on teaching theory of mind – current research (Holt et al., 2021) suggests this is something we should take account of in understanding people with autism and in designing relevant support strategies.

Executive Function
Executive function is the cognitive theory behind our ability to plan, organize and sequence thoughts and actions and to control impulses. It can affect our ability to be aware of and understand the passage of time. Working memory is an important aspect of executive function. This allows us to hold one piece of information in our mind as we think about another. What we might see in learners with ASD related to challenges with the executive function are: Inconsistency in learning – they can do it one day but not the next; clumsiness – walking over things or not seeming to notice people and things around them, or being 'in a rush'; difficulty moving from one activity to another; reluctance to try new things; particular difficulty sequencing tasks (e.g. dressing, organizing their school bag); and impulsive behaviour that they may later regret (Meltzer, 2018).

Weak Central Coherence
Central coherence is the cognitive theory behind our ability to see 'the big picture', to understand context and to use context to draw meaning. People with autism may tend to focus on the details rather than the whole picture. Challenges in this area may manifest as: Avoiding making choices; appearing to misunderstand everything you say; appearing to miss the point; focusing on 'irrelevant' details; reading fluently without comprehension; and rote learning math but struggling as it gets more complicated (Happé & Frith, 2006).

Context Blindness
Context blindness described by Peter Vermeulen, is the cognitive theory where there is a challenge in using visual, auditory, historical and social context in making sense of experiences in the moment. It is thought that people with this difficulty cannot respond to more than one stimulus at a time, therefore sometimes missing 'the obvious'. Challenges in this area may manifest as: Performing well in tests (e.g. of social skills or emotion recognition) but not in real life; not using seemingly obvious contextual information (e.g. knowing that the toilets in a bathroom showroom are not real toilets and should not be used!); demonstrations of 'over literal' or 'concrete' thinking; being overly formal or overly familiar; being overwhelmed by new people or places; oversharing of personal information; difficulty processing ambiguity (e.g. when someone says one thing but means another); finding it hard to see things from other people's perspectives; and difficulty adapting rules to changing social contexts – might 'police' others or just act unexpectedly (Vermeulen, 2015).

Double Empathy Problem
The cognitive theory of the double empathy problem, described by Damian Milton, suggests that when people with very different experiences of the world interact with one another, they will struggle to empathize with each other. Through this theory we recognise that as well as people with autism having social communication challenges, neurotypical people can equally have difficulties understanding the intentions and communication of the person with autism and that the problem is

a dynamic one, which does not lie solely with the person with autism. What we might see is miscommunication between both groups of individuals (Milton, 2017).

Monotropism

Monotropism is the cognitive theory describing the challenge of 'being in an attention tunnel'. It is the tendency to focus on one thing at a time and therefore miss contextual information. In order to perform a task, any individual needs to: See the point of the task – understand the goal; Value the point of the task – be motivated by it; See how to perform that task – understand precisely what task it is, know what steps must be taken to carry it out, and know how to take the identified steps. Monotropic individuals are likely to have problems with each of these. Challenges in this area that we might see in children with autism are: Preference for sameness; restricted, repetitive and stereotypic behaviours (e.g. repeatedly spinning the wheels on a car; talking about the same topic repetitively; having a specific interest in washing machines or only eating beige food); difficulty shifting attention from one thing to another; strong attention focus for some things and not others; a lack of preparedness for change - feeling like things that happen are unexpected because they have not focussed attention on signs others use for predictability; focusing on detail rather than the whole picture; uneven skills profile – related to areas of attention focus or areas not focussed on; being 'unable to move on' or getting stuck – and becoming prompt dependent (e.g. only putting their jacket on when the adult tells them to); reduced initiation; a need for order, familiarity and reassurance; reduced awareness of others, difficulty when people change their minds (inflexibility); if something doesn't work out as expected – they don't see any alternatives (Murray et al., 2005).

Additionally, people with ASD are at greater risk for some medical conditions such as sleeping problems, sensory issues, gastrointestinal problems, motor challenges, diet problems, seizures and mental illnesses (anxiety, depression, obsessive compulsive disorder and ADHD) (Volkmar, 2021)
In order to overcome the challenges for children with autism and improve their condition, a number of different treatments are used, including applied behaviour analysis (Rutherford & Johnston, 2019).

**Genetics of Autism Spectrum conditions**

Specific lines of research suggest that genetic factors are likely to cause the cognitive and neurobiological abnormalities observed in autism. As of this day, no specific gene or set of genes responsible for ASD has been identified yet. Despite this, specific regions of chromosomes have been suggested to be responsible for the condition.
A study conducted in 1991, which included 185 Utah families with ASD cases born between 1965 and 1984, suggested that the risk of autism among siblings was 4.5%. The study also suggested a tenfold (or ten times) rise over rates for the general population. (Jorde L et al., 1991; Baron-Cohen 2004). Another British study (Bailey et al., 2009), studied dizygotic pairs of twins (twins that inherit approximately 50% similar genes) and monozygotic pairs of twins (twins that inherit 100% similar genes). This study's findings indicate that 60% of monozygotic pairs were concordant for autism versus no dizygotic pairs. In addition, 92% of monozygotic pairs were concordant for a wider range of related cognitive or social abnormalities versus a 10% of dizygotic pairs. These findings suggest a high degree of genetic influence for ASD.
Four specific locations (or loci) on the X chromosome, which correspond to 4 genes, have been suggested to have an implication in autism. These genes are: NLGN3, NLGN4, MECP2 and FMR1 – the latter also being responsible for causing the fragile X syndrome (a genetic disorder that causes the mutation of the FMR1 gene which is responsible for the coding of the FMRP protein, a protein needed for healthy brain development) (CDC 2023). Figure 1 depicts two of these genes, NLGN3 and NLGN4. (Zhang et al., 2016; Baron-Cohen 2004). If we take into consideration that these 4 genes are located on the X chromosome, and males inherit 1 X chromosome as opposed to females who inherit 2 X chromosomes, this finding could

also explain the sex difference observed in the ASD diagnosis. The current ratio for ASD diagnosis corresponds to 4 males being diagnosed with autism as opposed to 1 female being diagnosed (Baron-Cohen 2004).
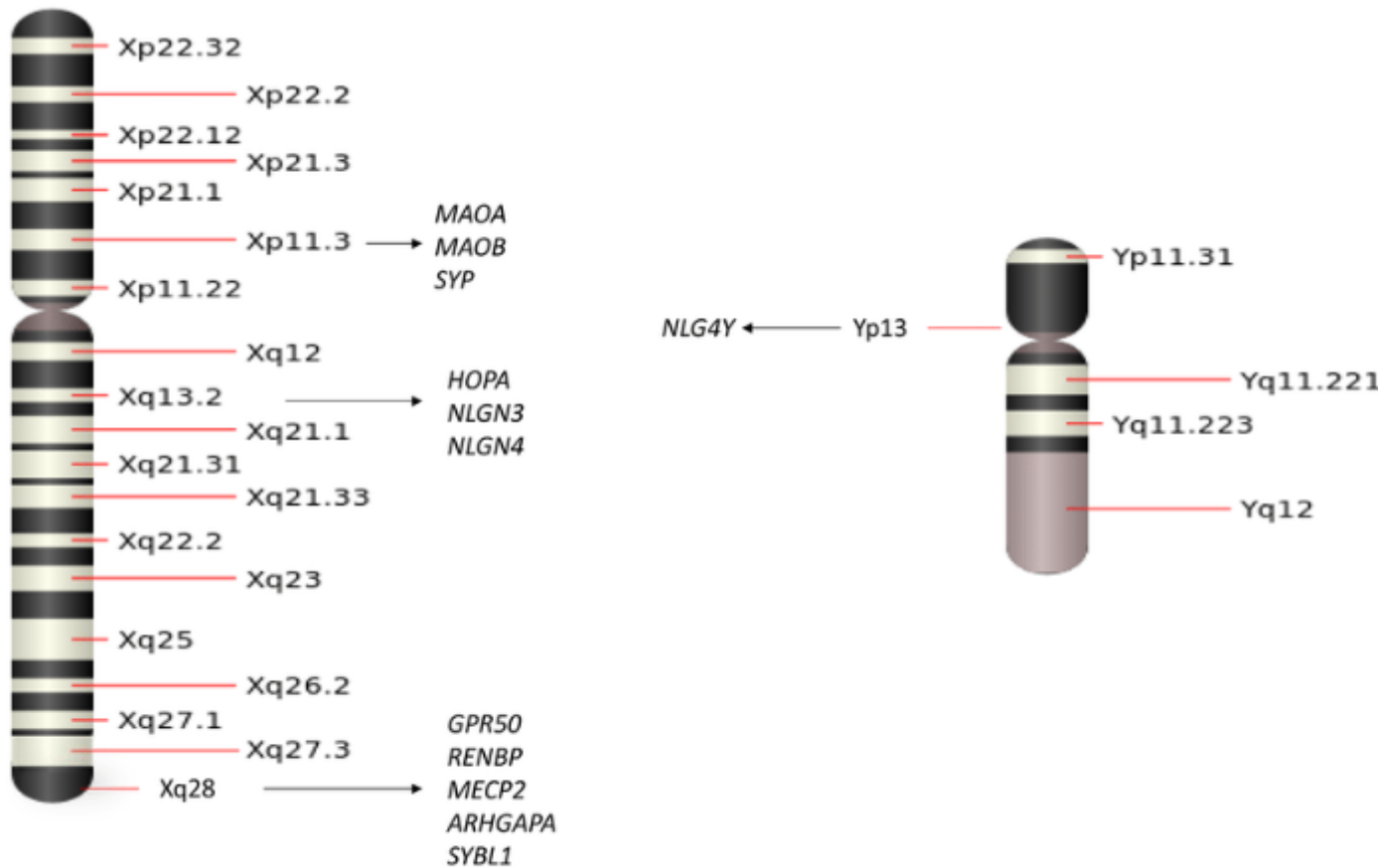
A schematic of the sex chromosomes with several adjacent genes that have been associated with psychiatric diseases.

Figure 1. NLGN3 and NLGN4 depicted on the X chromosome (Research Gate: Zhang, X., Yang, J., Li, Y., Ma, X., & Li, R. (2016). Sex chromosome abnormalities and psychiatric diseases. Oncotarget, 8(3))

This line of research aims not only to isolate the relevant genes but also to understand their function, and eventually the relationship between these different causal levels in autism. Research in this field is promising, since it is hoped that assessments of the most promising treatments will take place as part of gaining further understanding in detecting and treating Autism.

Autism: Neurobiological aspects; Neuroanatomy and neuropathology
Specific areas in the brain have been identified to have anatomical abnormalities in autism. These include the frontal lobes and the cerebellum (Fig 1). The frontal lobes are associated with the brain's ability to reason, organize, plan, speak, move, make facial expressions, serial task, problem solve, control inhibition, spontaneity, initiate and self-regulate behaviours, pay attention, remember and control emotions. The cerebellum, a brain area associated with regulation and coordination of movement, posture, balance and cardiac, respiratory and vasomotor centers, is suggested to. In the study of Carper & Courchesne (2000), an inverse correlation was detected between the frontal lobe and cerebellum sizes in children with autism: a

smaller volume was observed in the cerebellum in some ASD cases, simultaneously with a higher volume in the frontal lobe. These types of structural abnormalities in the frontal lobe would be expected to affect attention, working memory and problem-solving – all cognitive functions which are deficient in autism.

The parietal lobes (Fig 2) are responsible for the control of complex behaviours, including senses such as vision, touch, body awareness and spatial orientation. Portions are involved with our visuospatial processing, language comprehension, the ability to construct, body positioning and movement, neglect/inattention, left-right differentiation and self-awareness/insight. In regards to Autism spectrum disorder, several studies investigated head size and brain volume in ASD individuals, suggesting "an early cortical overgrowth followed by a premature arrested growth." Researchers Wallace et al., detected a significantly thinner parietal and temporal cortex in a group of 41 ASD individuals compared to the control group (40) and an age-related thinning in the ASD group.
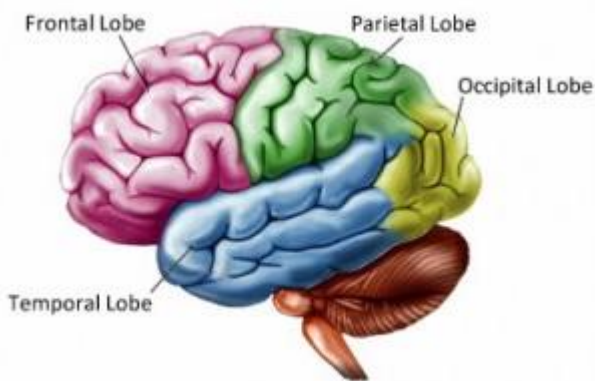

Figure 2: The schematic depicts the division between the four lobes of the brain: Frontal, parietal, occipital and temporal lobe.

Source: Northern Brain injury association: https://www.nbia.ca/brain-structure-function/

Another brain area associated with anatomical abnormalities in ASD is the brainstem, a brain area responsible for vital life functions such as breathing, heartbeat, and blood pressure. Research suggests that the recording of brainstem responses (or the electrical activity of neuronal cells found in the brainstem) provides information regarding how speech syllables are encoded by the auditory system and they are widely used in clinical practice, in order to assess the integrity of the auditory pathway. Russo et al. (2008) concluded that the brainstem response reflects various acoustic properties of the speech signal.

Given that a hallmark of ASD is the impairment in language, researchers Russo et al. (2009), focused on investigating the transcription of speech in 39 children (21 ASD verbal children and 18 typically developed children). The auditory brainstem responses of the children were collected while they were hearing the movies' soundtracks and during the production of a speech syllable. The results indicated a disruption specifically in the distinguishing of consonants, vowels and source cues something that facilitates in determining the speaker's identity and intent something that suggests a biological deficit supporting the social communication problems in ASD.

Another study by Russo et al. (2008) demonstrated the connection of a subcortical mechanism (deficient brainstem encoding of pitch) and prosody (the part of language that is conveying emotion while speaking – intonation, stress pattern, loudness, pauses, rhythm) in ASD children.

Several studies have reported poor motor performance in ASD individuals. Hanaie et al. (2016) used voxel-based morphometry (a computational approach to neuroanatomy that measures differences in local concentrations of brain tissue) in 19 ASD and 20 neurotypical children, in an effort to underlie the brain mechanisms responsible for the poor motor performance of ASD individuals. Their study indicated a positive correlation between poor motor performance and the volume of white matter (contains nerve fibers (axons), which are extensions of nerve cells (neurons)) in the brainstem. When compared to the control group, ASD individuals exhibited a decreased volume of white matter in the brainstem.
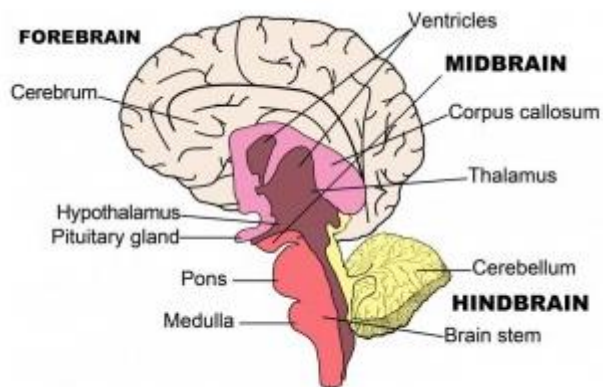

Figure 3: The schematic depicts the three divisions of the brain: forebrain midbrain and hindbrain

Source: Northern Brain injury association: https://www.nbia.ca/brain-structure-function/

In a study conducted by Sparks et al. (2002), Magnetic Resonance Images (or MRI scans) were collected from a total of 45 children diagnosed with autism (3-4 years old). In these MRI scans, the children with ASD presented an increased cerebral volume, and a proportionally increased cerebellar volume compared to typically developing children. In addition, it was found that the amygdalae and hippocampi of children with ASD, were enlarged bilaterally (also proportionally to cerebral volume increases) compared to the other group of children.

In another study of MRI scans, researchers Hashimoto et al. (1995) that during the development of the brainstem and cerebellum was significantly more rapid in autistic children than in the control group. However, while the brainstem and cerebellum were significantly increased within ASD individuals early on, these brain structures were significantly smaller in size in ASD individuals, when compared to the control group later on.

Researchers Aylward et al., 1999 in their MRI study observed a reduction in the volume of amygdala and hippocampus in ASD in relation to the total brain volume. Amygdala – an almond shaped structure found deep in the temporal lobe of the brain in both hemispheres (bilaterally), is associated with behaviour and emotion processing, including the fear response. Emotion-processing deficits are included in the impairments of ASD; an example supporting this, is a study conducted by Philip et al., 2010, where the emotion processing in a group of 64 adults (23 ASD and 23 controls) was investigated. ASD individuals were asked to recognize the five basic emotions (happiness, sadness, anger, disgust and fear) by observing facial expressions, body movement, and vocal stimuli. The ASD group presented more difficulty in recognizing all five basic emotions based on facial expressions, body movement and voice emotion and they presented the most difficulty in recognizing anger based on facial expressions and disgust based on body movement and voice emotion.
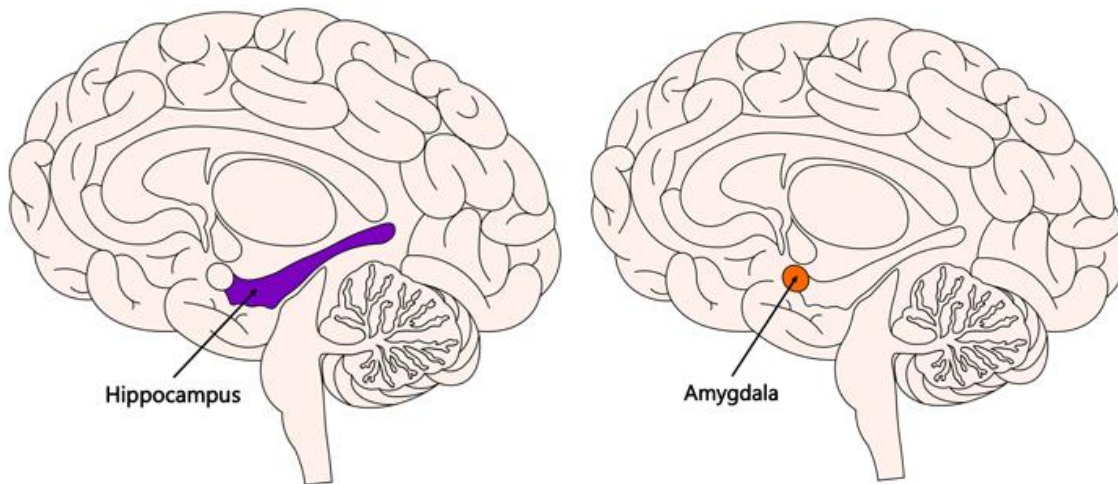
Figure 4a, b: The schematic depicts the amygdala, a brain area associated with processing emotion and emotional memory; The schematic depicts the hippocampus, a brain region associated with learning and memory.
Source: https://www.brainframe-kids.com/emotions/facts-brain.htm

Research of underlying neurobiological/anatomical structures that are implicated in ASD is crucial, given that it serves to elucidate the development of ASD over time. As the number of findings increases, the clearer it becomes that ASD individuals have a unique brain anatomy compared to neurotypical individuals and a strong neurobiology that supports their symptomatology. The more we understand about the human brain, the easier it is to promote inclusivity and further support ASD individuals.

3. Issues and difficulties faced by children with ASD in their daily life

3.1 The challenges young children with ASD face at home and in the Community

If a child is on the autism spectrum, and diagnosed with Autism Spectrum Disorder (ASD), you might find everyday routines, tasks and activities a little more difficult. Because autism is a developmental difference, **people with autism can often find it difficult to learn and manage everyday tasks**, like taking a shower, getting dressed, brushing their teeth and packing their school bag; or daily chores like making their bed, or setting the table. Because of this, usually they need to break down daily tasks into steps that will allow them to learn how to better manage, and take control, of daily routines and activities.

What are daily living activities?

Activities of daily living are the routines people undertake on a regular or daily basis, and often take for granted, these include:

- Meal times: preparing and eating regularly, including breakfast, lunch, dinner.
- Self-care: showering or bathing, getting dressed, cleaning teeth, doing hair and clipping nails.
- Sleeping.
- Toileting.

Why are daily living activities important?

- Independence: if you are able to look after yourself by undertaking these key activities of living you are more likely to be able to live safely and independently as an adult.
- Self-esteem: self-reliance helps with self-esteem, it feels good to be able to look after yourself without needing help.
- Less reliant on others: as with the above two points, it's an excellent goal to be able to function on your own without needing assistance from other people if possible.
- Skills for life: these daily living skills are tasks that everyone needs to undertake every day throughout their life. If you can learn to undertake them yourself early, it will make life a lot easier and improve your quality of life.

People on the spectrum often need to plan tasks in order to know that they are necessary, and as such, may need reminders and extra support to incorporate tasks into their daily lives.
You can help a person on the spectrum to develop these daily skills through the step-by-step teaching technique. This includes:

- Ensuring they are aware of the necessity of the activity.
- Breaking tasks down into simple step-by-step routines.
- Teaching them each step and encouraging them through the steps daily.
- Gently providing prompts to support the completion of the task.
- Celebrating and rewarding success when milestones are achieved
(https://thespectrum.org.au/autism-strategy/autism-strategy-activities-daily-living/)

3.2. Life skills young children with ASD usually lack (e.g. social and communication skills)

The most known definition of autism is that" Autism spectrum disorder (ASD) is a developmental disability that can cause significant social, communication, and behavioural challenges". It is also well known that people with ASD share some symptoms, such as difficulties with social interaction, but there are differences in when the symptoms start, how severe they are, the number of symptoms, and whether other problems are present. The symptoms and their severity can change over time. The ability of children with ASD to communicate and use language, depends on their intellectual and social development. Some children with ASD may not be able to communicate using speech or language, and some may have very limited speaking skills. Others may have rich vocabularies and be able to talk about specific subjects in great detail. Many have problems with the meaning and rhythm of words and sentences. They also may be unable to understand body language and the meanings of different vocal tones. Taken together, these difficulties affect the ability of children with ASD to interact with others, especially people their own age.

Below are some patterns of language use and behaviours that are often found in children with ASD.

- **Repetitive or rigid language.** Often, children with ASD who can speak, will say things that have no meaning or that do not relate to the conversations they are having with others. For example, a child may count from one to five repeatedly amid a conversation that is not related to numbers. Or a child may continuously repeat words he or she has heard—a condition called echolalia. Immediate echolalia occurs when the child repeats words someone has just said. For example, the child may respond to a question by asking the same question. In delayed echolalia, the child repeats words heard at an earlier time. The child may say "Do you want something to drink?" whenever he or she asks for a drink. Some children with ASD speak in a high-pitched or sing-song voice or use robot-like

speech. Other children may use stock phrases to start a conversation. For example, a child may say, "My name is Tom," even when he talks with friends or family. Still others may repeat what they hear on television programs or commercials.

- **Narrow interests and exceptional abilities.** Some children may be able to deliver an in-depth monologue about a topic that holds their interest, even though they may not be able to carry on a two-way conversation about the same topic. Others may have musical talents or an advanced ability to count and do math calculations. Approximately 10 percent of children with ASD show "savant" skills, or extremely high abilities in specific areas, such as memorization, calendar calculation, music, or math.
- **Uneven language development.** Many children with ASD develop some speech and language skills, but not to a normal level of ability, and their progress is usually uneven. For example, they may develop a strong vocabulary in a particular area of interest very quickly. Many children have good memories of information just heard or seen. Some may be able to read words before age five, but may not comprehend what they have read. They often do not respond to the speech of others and may not respond to their own names. As a result, these children are sometimes mistakenly thought to have a hearing problem.
- **Poor nonverbal conversation skills.** Children with ASD are often unable to use gestures—such as pointing to an object—to give meaning to their speech. They often avoid eye contact, which can make them seem rude, uninterested, or inattentive. Without meaningful gestures or other nonverbal skills to enhance their oral language skills, many children with ASD become frustrated in their attempts to make their feelings, thoughts, and needs known. They may act out their frustrations through vocal outbursts or other inappropriate behaviours.

(https://www.nidcd.nih.gov/health/autism-spectrum-disorder-communication-problems-children)

Depending on their ability for communication and interaction, they can have challenging behaviour because these problems produce other problems that come from the need for expressing feelings, wishes, everyday needs etc. Common challenges that they are facing are:

Anxiety
Anxiety is a normal part of development, but research confirms that people with autism experience elevated levels of anxiety in comparison to their typically developing peers. An extensive review of the literature by White et al (2009) revealed that up to 84% of individuals with autism meet the criteria for clinically diagnosed anxiety disorders.
Due to characteristic communication difficulties, an autistic person may have severe anxiety issues but have a decreased ability to express it. As noted by Howlin (1997), "…the inability of people with autism to communicate feelings of disturbance, anxiety or distress can also mean that it is often very difficult to diagnose depressive or anxiety states."
Anxiety may manifest in an autistic person through:

- social phobia
- excessive worry/rumination
- obsessive compulsive behaviour
- hyper-vigilance, or seeming "shell shocked"
- phobias
- avoidance behaviours
- rigid routines and resistance to change
- stimming and/or self-injurious behaviour

- controlling behaviours – oppositional defiance
- meltdowns
- shut down

Dealing with change

People on the autism spectrum can find changes very stressful. Due to the behavioural, information processing and sensory aspects of their diagnosis, many people on the autism spectrum often prefer familiar environments with a predictable routine. Restricted and repetitive interests, sensory processing differences and heightened anxiety can make even small changes stressful. Planning ahead and preparing for changes in everyday routines and activities is important.

Transition planning

Change is an inevitable part of every person's life. Teaching a person strategy to cope with changes in their environments and routines, helps to build resilience and independence. Preparing people on the spectrum for upcoming changes is referred to as "transition planning". The purpose of transition planning is to enact change in a way that feels safe and predictable for the individual on the autism spectrum. Effective planning helps reduce stress and anxiety and helps prevent behavioural issues that may occur because of either expected or unexpected change.

Everyday changes and "horizontal planning"

Some everyday changes or new situations a person with autism may need preparation for might include:

- leaving the house
- having visitors at your house
- going somewhere new, such as the dentist
- switching between activities or tasks during play or learning
- doing things in a different order from time to time – for example, having a bath/shower before dinner rather than afterwards
- eating new foods

These frequent changes that may occur on a daily basis are known as horizontal transitions.
Many people on the spectrum have strong visual learning and thinking styles. Visual strategies can therefore be an effective way in which to communicate upcoming changes. Common visual strategies used in horizontal transition planning include Social Stories, social scripts, task lists, schedules such as timetables, daily planners and calendars.
When visiting a new place, having photos to prepare the individual for what to expect can be helpful. Pictures can be obtained through websites or by exploring a location via the Google maps street view function. Requesting images may also be an option, for example, contacting the doctor's practice and requesting a recent image of the doctor and the consult room in advance of the appointment.
There are an ever-increasing number of apps that can help with autism-related challenges.

Longer term changes and "vertical planning"

Progressions from one life phase to another are known as vertical transitions. The progression from primary school to high school is an example of a vertical transition experienced by children in the middle years.
Research has revealed some good practice guidelines for preparing for major life transitions:

1. **Gather information:** What change is about to occur? When, where, and who with? How has the person reacted to previous transitions and changes? What transition strategies have helped in the past?
2. **Develop a plan:** Meet with all the key people who will support the person through the change to develop a plan to support the transition.
3. **Create supports,** such as visual sequences, social scripts, transition stories, sensory supports, and short movies.
4. **Implement the plan.**
5. **Evaluate and review:** Was the transition support plan effective? What should be changed for next time?

Bullying

Bullying can happen to people of all ages and abilities, but people with developmental differences or disabilities are especially vulnerable. Bullying involves an imbalance of power and takes physical or psychological form. Psychological bullying includes threatening, coercive and manipulative behaviour.

(https://www.autismtas.org.au/about-autism/common-challenges/)

4. Teaching Interactions Procedure

4.1. Introduction to TIP

The teaching interaction procedure (TIP) is a systematic teaching package which consists of six steps (Phillips et al. 1974). It is a 6-step process in which the teacher identifies and labels the skill to be taught, provides a rationale tailored to the student, describes and models how to perform the behaviour, and then practices the skill with the student through role play. The teacher provides feedback including both praise and corrections as needed. Finally, the behaviour is observed in natural contexts to ensure its use in the student's most important social and learning environments.

The TIP was created as a component of the Teaching Family Model. Phillips et al. (1974) were the first professionals to use the term "teaching interaction" when they described the procedure in The Teaching Family Handbook. Since the TIP was first conceptualized, it has been described in several curriculum books (e.g., Hazel et al. 1983; Dowd et al. 1994) and evaluated in various research studies (e.g., Harchik et al. 1992). In 1992, Harchik and colleagues evaluated the effectiveness of the TIP to teach group home staff members to better implement a token economy, increase the amount of time adults engage with group home members in activities, and increase the number of teaching components utilized throughout the day. The results of this study demonstrated the TIP was an effective strategy to increase all of these behaviours.

The Teaching Interaction procedure is different from the Behavioural Skills Training, it includes a description of rationale to engage in the target skills. Inclusion of rational components may be important for the student to provide self-instruction to himself or herself to engage in the target skills when the teacher is not present. Thus, the rationale that the teacher provides should be potentially rewarding to the student.

Despite professionals implementing the TIP clinically (Leaf et al. 2011), it was not until 2009 that the TIP was first empirically evaluated for individuals diagnosed with ASD (Leaf et al. 2009). Leaf and colleagues evaluated the effects of a TIP, paired with a token economy, on increasing social skills across four broad domains (i.e., social communication, social play, social emotional skills, and social friendships). The researchers utilized a

multiple baseline design across skills and replicated across participants. The results indicated the TIP was successful at increasing the rate at which all of the participants demonstrated all targeted social skills. Leaf et al. (2010) extended the research on the teaching interaction procedure by evaluating its effectiveness when implemented in a group format for four children (4 to 6 years of age) diagnosed with ASD. Targeted social skills for all four participants were showing appreciation, giving a compliment, making an empathetic statement, and changing the game when someone was disinterested. The results of a multiple-probe design showed that participants were able to demonstrate the targeted social skills following the intervention and that these skills generalized outside of the training environment.

Dotson et al. (2010) evaluated the effectiveness of the teaching interaction procedure for teaching adolescents (13 to 18 years of age) diagnosed with ASD and other disabilities a variety of social behaviours. Targeted social skills included basic conversational skills, giving feedback during conversation, and asking and answering questions. The results showed that four of the five participants reached the mastery criteria, with variable maintenance across the five participants.

In addition, there have been several studies that have evaluated the effectiveness of the TIP for teaching individuals diagnosed with ASD (e.g., Dotson et al. 2013; Kassardjian et al. 2013; Leaf et al. 2012a, b). Ng, Schulze, Rudrud, and Leaf (2016) expanded the implementation of the teaching interaction procedure for individuals diagnosed with ASD who were more impacted (e.g., limited vocal-verbal repertoires, had high rates of stereotypic behaviour, and demonstrated fewer social behaviours). In this study, the authors modified the teaching interaction procedure by incorporating visuals (e.g., pictures of the rationales). The results of the study indicated that the four participants (ages ranging from 8 to 14) learned the targeted social behaviours in the study.

Peters, Tullis, and Gallagher (2016) evaluated the effectiveness of the teaching interaction procedure to teach four children (8 to 10 years old) diagnosed with ASD a variety of social behaviours (e.g., changing a game when bored). The teaching interaction procedure was implemented in a group setting in a classroom at a school. Peters et al.'s results aligned with that of other research labs in that participants learned the targeted social skills and the skills maintained at or near the mastery criterion following completion of the intervention. Furthermore, parents of the participant indicated they were very satisfied with the intervention. Within these and other studies, the TIP has shown to be an effective teaching strategy for individuals diagnosed with ASD.

The aim of a TIP is to facilitate the development of language and its appropriate use, expose clients to social reinforcement, and enhance a variety of social skills across various skill levels. Generally speaking, TIP's can be used to teach communication, emotional regulation, play, and friendship skills. More specifically, we can use TIP's to teaching some of the following skills: sharing, reciprocal conversations, appropriate body language, understanding non-verbal behaviour, tolerance of others' behaviour, perspective-taking, theory of mind, using assertive language with peers, discussion and cooperation in play, behaviours regarding sexual development, age-appropriate privacy and many other social skills…

Prerequisites for a TIP being run effectively include the following skills:

- Basic conversational ability (moderate receptive and expressive language)

- Basic social tolerance and awareness of peers

- Understanding of cause and effect and why/because reasoning

4.2. Methodology

What are the steps for a TIP?

- Label and explain what skill you are focussing on. Using a fun or catchy label can enhance the student's attending and initial interest in the topic.

- Identify a rationale appropriate for the student. Why should this be important to learn and practice? Critical that this component is driven by interests and values of the student. It must connect to them personally if it is to be successful, and become a spontaneous behaviour that continues in their natural environment

- Describe the skill and break each step down. We must use clear and age-appropriate language for the student so they clearly understand the topic.

- Demonstrate the skill and practice with the student. Role play different scenarios relevant to the topic, and likely to occur naturally in the student's life. Provide feedback, both positive and corrective. Clearly state what the student did well in and what they could improve on in future

- Provide external consequences if appropriate. E.g., For a student with a points system, provide points for each task behaviour, engagement with the activity, and appropriate answers.

- Ensure the skill is observed in increasingly natural contexts. This will provide information as to the use of the skill where it matters most, and may prompt adjustments to further teaching.
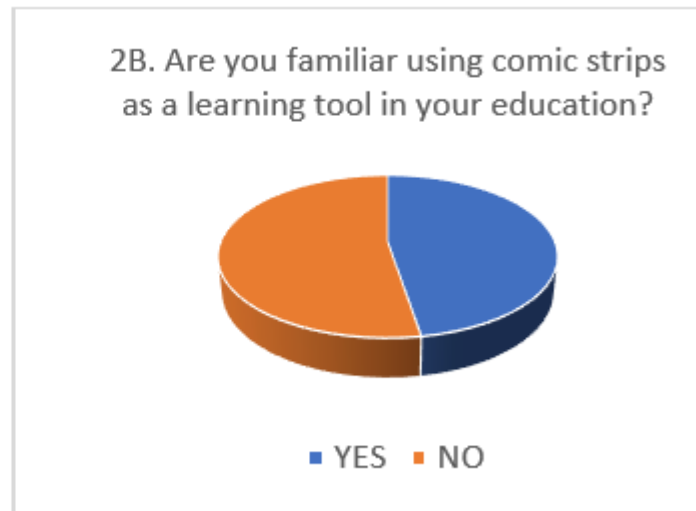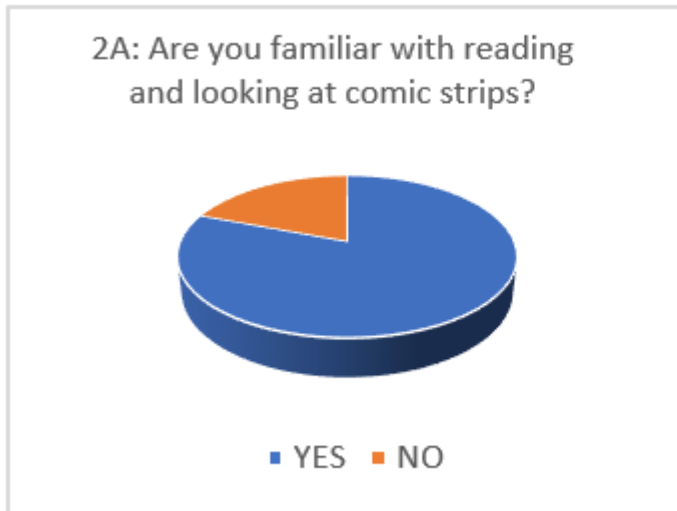
5. Needs analysis

5.1. Transnational survey

The sections of the transnational report convey the results of the responses/answers obtained through the survey initiated by SOSU Ostjylland and carried out by Autismo Burgos, Innovation Hive, Sina Svetulka, SOSU Ostjylland and STANDO in the TIPS project.

We received responses from a total of 57 teachers/educators and 48 parents/relatives who answered a digital questionnaire we distributed.

Educators/teachers:

When asking the teachers/educators of the relevance of using IT, for example gamification, as learning material a majority of the respondents were familiar in using digital games as a learning tool and felt that they were experienced users of digital tools in their education, but when it comes to using comic strips as a learning tool, less than half of the teachers were used to apply it as a learning tool.

2A: Are you familiar with reading and looking at comic strips?

- YES - NO

2B. Are you familiar using comic strips as a learning tool in your education?

- YES - NO

The majority however could see the benefits of using digital tools such as gamification and comic strips as a learning tool, when working with the education of children with ASD, and few educators/teachers were worried about the use of digital learning tools, when it comes to topics related to children with ASD.

According to the results from the teachers/educators, most of the responses to the questionnaire refer to the need for empowerment of autistic persons' self-confidence and social skills development, including the enhancement of cognitive skills in order to communicate, cooperate and build relationships with peers and other people in everyday life. This would put the child in an adequate position to appropriately respond in social contexts, understanding and interpreting human reactions and learn which behaviors are considered as socially acceptable or not.

Most of the respondents mentioned that the 2 personal competencies which could be strengthened by digital gaming and comics strips as learning materials are self-confidence and emotions management, building relationships and communication skills. The child could also benefit in the crucial field of recognizing his/her emotions, in order to adapt to a situation and manage it appropriately. Interactive tools could also facilitate positive emotions, such as happiness, enhancement of self-esteem and confidence. Digital tools could also augment the children's interest to the learning process, since they are considered to be highly stimulating.

Across all transnational responses from educators/teachers, self-care, communication, stress management, social relationship management and problem solving are life skills that can be strengthened by the use of digital teaching material in the form of gaming and comic strips, as a positive contribution to learning for the children with ASD. Another aspect of using these digital tools in a learning environment is enhancing creativity, critical thinking, learning to ask and seek for help once needed and being able to face daily problems for the children.

The respondents also believe that social skills can be developed through digital gamification and comic strips, and for this reason they need more educational digital material to be effective in the support of their students.
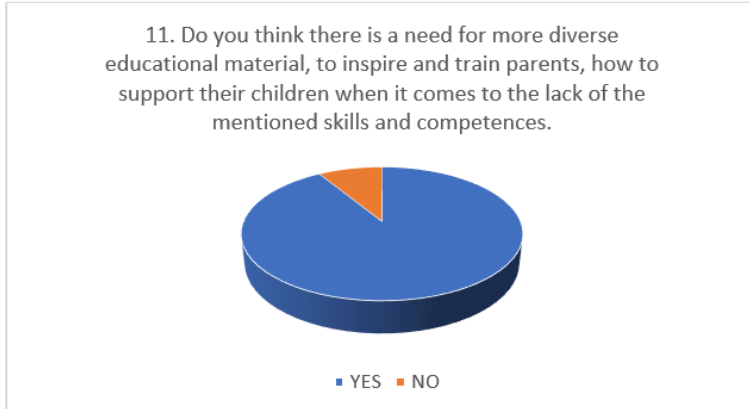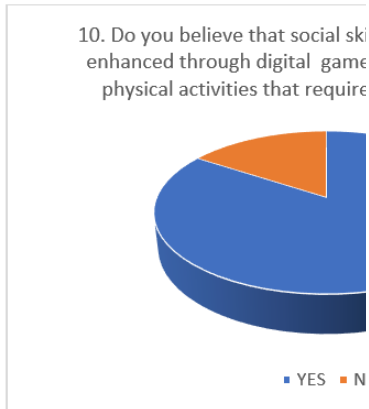

These answers highlight the urge for adding new resources to the traditional

educational ways that might seem effective so far, but with the proper integration of technology in it, we can expect even better results.

Parents:

When asking the parents of children with autism, the collected result show that overall, they are familiar with the use of digital games and their use as tools in education.
At the same time, they are familiar with comic strips, however only a small majority of them know of the use of comics strips in learning. Even though the percentage is positive, there is still room for improvement, finding effective ways to convince the respondents in terms of digital interactive tools and methods that do not actually require human interaction, but can assist to the learning process, and even easily facilitate it.

The vast majority of the respondents can actually identify the benefits on using digital tools, such as gaming and comic strips, even though they do not consider themselves as experienced users of digital tools, in order to strengthen learning and contribute to the child's competence development, highlighting an urge to escape from traditional means and methods, and an effort for experimenting in learning.
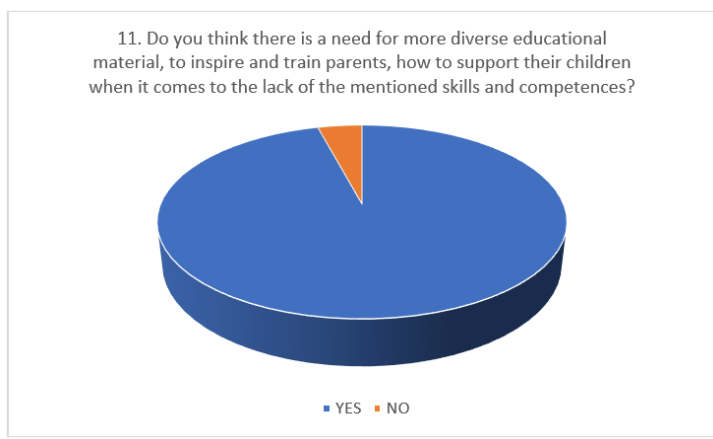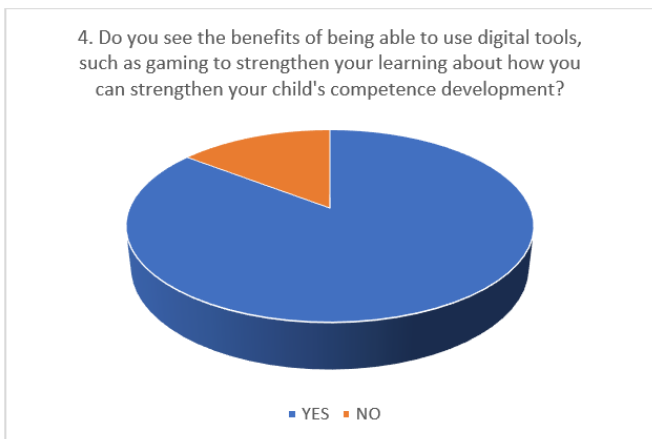
The parents are split in halves, believing that digital tools such as comic strips can be problematic as learning material, when it comes to targeting children with ASD.

According to the results from the parents, most of the responses to the questionnaire refer to the need of developing interactive learning material, which focuses on social competences such as; perception of emotions, emotional intelligence and expressing emotions, including social, behavioral, emotional and cognitive skills such as self-control and language, the ability to build relationships, empathy and respect. The parents believe that the use of innovative and interactive digital methods such as comic strips could enhance the whole concept of social interaction.

When asked what personal competences they would like the interactive learning material to focus on, self-awareness, emotion regulation, emotion management and communication issues are the most mentioned personal competences by the respondents.
Digital tools and methods could also assist in the development or enrichment of active listening and actual perception of the external social signs from the environment, obtaining experiences and judgment to be in a better position to recognize feelings, in order to be capable of managing them.

Regarding life skills, the respondents mentioned that the digital tools should be focused on the enhancement of problem solving, decision making and communication. They could also enhance developing critical thinking, creativity, better perception of social interaction and adaptation to the situation, as well as relationship building and effective collaboration with others including solving conflicts.

A vast majority of the parents are positive to the question regarding the development of the social skills through digital games and comics, indicating that there is a strong belief that social skills can be obtained, or enhanced, not only through physical socializing and interaction with other people, but through digitization methods as well.
Also, a vast majority of parents believe that the digital tools can boost the social skills of children with autism. Additionally, all parents would like alternative educational and teaching methods for the education of their children, indicating the need for adding new resources to the traditional educational ways which could be characterized as insufficient when it comes to the specialized needs of children with autism, especially regarding training of social skills.

Conclusion:

In the two parts of the transnational report of surveys, obtained through the survey initiated by SOSU Ostjylland and carried out by Autismo Burgos, Innovation Hive, Sina Svetulka, SOSU Ostjylland and STANDO in the TIPS project, a total of 105 respondents have answered, 57 teachers/educators and 48 parents.

Both teachers and parents are familiar using digital games and a majority of both groups are also familiar using digital games in education. While both teachers and parents are used to read comic strips, a small majority of the teachers are not used to comic strips as a learning tool in education, whereas a small majority of the parents are used to this. A majority of both teachers and parents consider themselves as experienced users of digital tools in education with the teachers as the most experienced.

A vast majority of teachers see the benefits of being able to use digital tools, such as gaming to illustrate learning content and learning objectives in relation to teaching and strengthening the skills of the parents to enable them to strengthen the personal, social and life skills of their children with autism, the same goes for the parents themselves.
Regarding the benefits of being able to use digital tools comic strips – to illustrate learning content and learning goals in relation to teaching parents to strengthen the personal, social and life skills of their children with autism a large majority of teachers see the benefits and so do the parents.

The teachers do *not* think it is problematic in any way to use **Comic strip** as learning material, when it comes to topics related to children with ASD, however, this does not apply to the parents.

The parents are spilt in halves on this question, indicating that the use of comic strips as a learning material might be a sensitive issue.

Both teachers and parents make a comprehensive contribution pointing out *social, personal and life skills competences* desired to be in focus in the material to be developed during the TIPS project. Summing up all the competencies in the conclusion goes too far, but there is a strong focus on communication skills such as understanding verbal and non-verbal communication signals, perception, recognition and control of emotions, self-awareness, relationship building and empathy.

A majority of the teachers believe that social skills can be developed or enhanced through digital games/comics, this statement is supported by the parents to an even higher degree.

Finally, both teachers and parents to a large degree think there is a need for more diverse educational material, to inspire and train parents, how to support their children when it comes to the lack of the mentioned skills and competences, making the development of such material in the TIPS project highly relevant.

6. Gamified social skills training

6.1 Special needs of target group in terms of social skills

Information and Communication Technologies (ICTs) in general and especially online games alongside digitized interventions are widespread for their impact in terms of social and emotional development of children with Autistic Spectrum Disorder (ASD) (Malinverni et al., 2017). As a developmental disability ASD is undeniably affecting the communication process of a person who typically manifests limited interests and repetition of behaviour. It is noteworthy that the available research in the field is still limited, lacking strong multiple evidence. The majority of research evidence represents pilot studies characterized either by a limited sample or by being vague regarding the acquired skills and their integration in real-life situations (Kellidou et al. 2020).

Digitized games are in fact online environments adopting specific structural elements and their interaction with the gamer is defined by the mechanics of each game in terms of game scenario, specific context and narrative details. Thus, players are summoned to reach the game goals by completing tasks, solving issues and making decisions. Online games have been proven to significantly boost the learning process by occupying players, prompting and assisting them to acquire not only certain knowledge relevant to the game context but also problem-solving, reflective and critical skills and empathy transferable in real surroundings. The term ''serious games'' describes the usage of specialized digital gaming in order to confront a package of learning and behavioural goals taking a step further from entertainment and introducing education (Schuller et al., 2013). The adoption of serious games in the sector of special education has increased during the last few years. Nowadays, young people with ASD are committing more and more to online environments since they consider them more predictable and safer in comparison with an autistic day centre or a classroom. Research findings confirm that children with Autism enjoy playing online games as the rest of the children their age (Durkin, 2010). For this reason, it is necessary to examine the optimization of ASD digital games and develop the existing practices, especially for children as they are still growing and their brain is not fully developed. From that perspective, there are more possibilities for improving social skills such as communication in comparison with adults as they have not yet fully experienced the adversity of certain aspects of society.

Previous research in the field of autism confirms the efficiency of digitised games to be helping children regarding expressing their feelings and boosting their interaction with other people (Zakari and Simmons, 2014). Lofland (2016) as an educational consultant for the Indiana Resource Centre for autism states that

children with autism tend to learn faster through online visual resources as they comprehend images better than words. In more detail, Acer for Education (2017), suggests some practical examples to address the needs of individuals with autism and facilitate their learning:

· Use of online visual resources (Interactive boards, digital activities, smartphones and tablets, text-to-speech software, digital editing tools and voice dictation tools

· A friendly robot to accompany the learner during classroom

· Digital Apps

It is clear from the information above that digitised games are the primary means through which children with Autism can develop further their social interaction. For example, a digital game through social scenarios can stimulate effective social interaction and communication of needs as well as practice facial expressions.

6.2. Learning outcomes

Interactive Technology and more specifically digitised games might be the most effective interventions for children with ASD. Autistic people are facing 3 vital difficulties:

1. Decreased social relationships

2. Communication problems

3. Tendency for repetitive and restricted behaviours

Most autistic children are usually isolated from their peers. This, as the primary issue, leads to verbal difficulties and relevant communication problems. Since their interaction is extremely limited with other children, they are not able to practice this skill. But communication is not only based on the verbal aspect. Autistic people also have limited capabilities in recognizing facial expressions and other non-verbal forms of communication as a result of this 'chain issue'. Thirdly, most ASD individuals have stuck to their routine and they are unable to change it and introduce new activities.

The adoption of digitalized environments offers the option of engagement while decreasing any feelings of stress in comparison with real-life face-to-face human interaction (Tsai and Lin, 2011). Transportes, Face Say, FaceLand, Let's face it and FaceFlower are some instances of online games that can boost the interpretation of facial expressions. The beneficial aspect of these types of games is that children practically use their facial muscles to express emotions. So, it is not only recognizing but also indicating their own temper. Hence, it is possible that online games tailored to ASD needs are able to support the rehabilitation of children. Interactive digitised apps encourage the user to actively participate in the game scenario and provide a sense of control during the learning procedure. This is crucial for the case of Autistic children, as they are more prone to passive behaviours.

Further benefits of digitised games can be found in Lányi and Tilinger's (2004) research are:

· Isolate disruptive noises that could be a distraction, boosting further the focus of the gamer on specific tasks

· Online games can be viewed as a 'silent teacher' who transmits rules and various concepts without using verbal or written communication. A certain function of an object could be linked with a specific interaction of the individual. This might facilitate the comprehension of frameworks by practicing specific actions and not abstract thoughts.

· Control over the digital world. At this point, it would be beneficial for children to start with a certain level of difficulty and increase it over time.

· They offer the opportunity of guided adjustment which makes it able to generalize activities and tailor them to the needs of each individual.

· Learn from mistakes. Digital games allow children to learn from a mistake without experiencing the feeling of humiliation as it could happen in a real-life situation. This also eliminates any triggers or dangerous consequences in terms of attitude change.

· Since autistic children have mainly visual thoughts, virtual games are ideal for transmitting information

6.3. Content of learning modules

Over time, research reveals that there are several attempts to address the needs of an autistic child through digital games to acquire the habits of everyday life.

In 2011, Arshia and her team (Hassan et al., 2011) created a computer game that offered storytelling concepts that was able to help ASD children aged 9 to 14 years old comprehend the usage of money. The game also supports children's behaviours and appropriate actions while shopping. The game is developed on BYOB (Build Your Own Block) an advanced offshoot of the game engine Scratch.

Anwar et al., (2011) created an interactive digitised game for children with autism in order to improve their fluency during speech. The research team structured the game in a way that the player had to pronounce correctly the objects shown on the computer screen during a certain and small period of time. Within the same context of language, Frutos et al. (2011) suggested a platform with the purpose of providing alternative solutions for the reinforcement of speech to autistic children and teenagers using an uncomplicated and easy-to-learn game tailored to their personal needs and characteristics. The specific game is a combination of two apps. The organizational one and the game itself. The results are visible as a bar chart using percentages measurement for every correct pronunciation of a word. Lastly, there is the option of saving each game's result to keep track of the progress of an individual.

Lastly, Davis et al. (2007), created the TouchStory software game that focuses on the aspect of narration in autistic children. This game is visually based and intends to facilitate narrative structure thinking by introducing simple picture tasks.

In a nutshell, there are various options for children of all ages to practice skills such as interaction and communication through online games. Nevertheless, it is noted that all research above as well as relevant in the field is currently exploring the development of existing apps or creating new ones rather than searching for ways of incorporating these as strategies within the education setting. As the results are encouraging so far, more attention should be given to the adoption of online games in education settings so as to facilitate a smooth and efficient learning impact.

6.4. Social stories - scenarios of social skills

These days, there is a growing interest in digital games for people with ASD. The high-quality apps available in the market can help children in gaining confidence and experience a sense of achievement. Before proceeding further, it should be noted that anyone responsible for game-based interventions should carefully choose a suitable platform to address the needs of an autistic child. This requires knowledge of the child's strengths and limitations to a great extent. The following section lists some game-based scenarios examples.

Stories2Learn

Source: https://edshelf.com/tool/stories2learn/

Stories 2 Learn (S2L) is a tool appropriate for individuals with Autism and other disabilities in the developmental framework. S2L is downloadable on all iOS devices and offers the ability of parents and educators to create personalized stories using personal material such as photos, texts and voice messages. The produced stories can be used for a variety of skills like literacy, leisure and social development. They focus on areas of reciprocal play, non-verbal communication, playground and school rules, etc. With S2L an individual can create a story with their own audio and compose the dialogue themselves. The current app is a good practice of social messages and is efficient for children who prefer visual support in general.

Grace

Source:http://www.graceapp.com/blog/grace-app-for-autism-how-an-app-can-change-lives/

Available for iOS and Android devices, Grace is a communication-oriented app for nonverbal children and individuals with Autism. Within the app an individual is able to form 'visual sentences' in order to communicate their needs. This can also indirectly promote verbal communication if the educator or the parent of the child adds to the pictures a spoken sentence or an explanation. In more detail, Grace offers a variety of pictures itself as well. In this way, the user can create a book that can carry it around them and when there is difficulty to express a need then the picture vocabulary can make things clearer. It can store

basic vocabulary visuals such as food, colours, shapes and things that a child may like.

What's the word

Source: https://apps.apple.com/us/app/whats-word-new-quiz-pics-word/id573511269
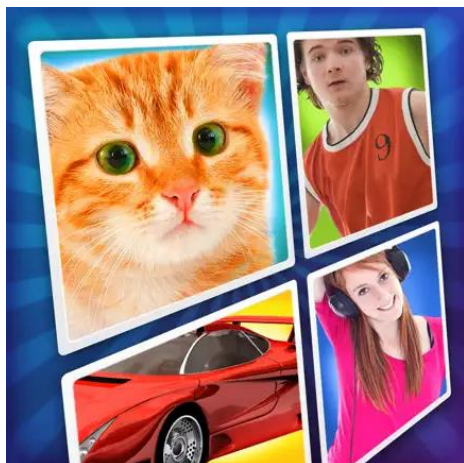
Another tool for Android and iOS devices is focusing on verbal skills and vocabulary. What's The Word app presents a set of pictures and the player must choose the right word that describes all of them simultaneously. It is a funny and interactive game with the purpose of increasing vocabulary. It is also suitable to address Asperger Syndrome which is characterised by high difficulty in self-expression.

Daniel Tiger's Grr-ific Feelings

Source: https://pbskids.org/apps/daniel-tigers-grr-ific-feelings.html

The current app is addressed to children of early-education such as preschoolers and kindergarten students. Daniel Tiger's Grr-ific is a social and emotional learning app inspired by the cartoon series of Daniel Tiger's PBS which might be familiar to some children. Navigating on the app's main page, children have the option of tapping in four areas. In the trolley area, kids are able to move the trolley by using their fingers while swiping toward a specific direction. Then, by spinning a wheel they can see the mini-game that they landed on. They can choose between 18 songs by tapping certain pictures. At the photo booth area, children use the

camera and tap on a ''feeling face'' which they are trying to mimic. There is also the option of drawing and the provision of calm-promoting activities.

Lastly, in the context of the TIPS project, an online game will be formed in a typical 'snakes and ladders' format, where games roll dice, answer questions, and choose within different social scenarios. The endurance of the game would be 30 minutes where two competitors will take real-life decisions and answer engaging questions. All representative countries will contribute to its creation, providing the game with an international style, adaptable to multiple cultures.

# 7. Design thinking and design principles

7.1. Design thinking

Learning objectives:

This course places both problem solving and problem solvers (in this case you) into the spotlight, aiming at helping them address problem situations more efficiently. On this journey, we will examine some of the most popular design processes, identify their key characteristics, which we will later use to set up design processes that meet the particularities and needs of your own design teams.

Content body:

Human-Centered Design has been evolving alongside technology. The more technology matures and is adopted by humans, the more the need for interfaces that are easy to use and, most importantly, address human needs is increasing.

There are several ways to apply Human-Centered Design when creating new experiences. In this section, we are going to examine one of the most popular ones: Design Thinking. Design Thinking was coined by IDEO's Tim Brown and David Kelley as well as Roger Martin. According to Tim Brown: "Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success".
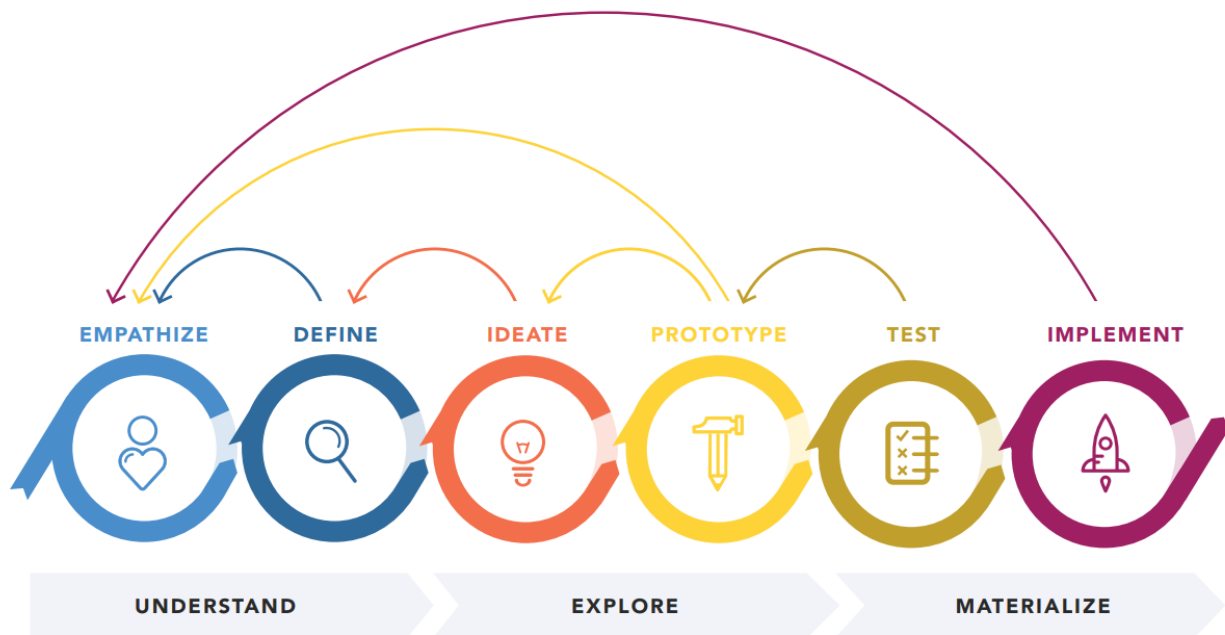
Design thinking is an approach to design, which also comes with a suggested process. The process consists of three phases (Understand, Explore and Materialize) and of six steps:

Understand

- **Empathize**, where we try to understand what our users do, think and feel, as well as what their problems are.
- **Define**, where all the research and knowledge about our users, our business objectives and learning goals are synthesized, highlighting problems of our users and opportunities for us to propose innovations.

Explore

- **Ideate**, where we brainstorm, producing as many ideas as possible. At this stage, ideas can be ambitious or far-fetched. The objective of this step is to help designers come up with as many ideas as possible.
- **Prototype**, where all the ideas that were previously proposed are grouped and selected. Ideas that are considered interesting and feasible are picked and become concrete through prototyping.

Materialize

- **Test**, where the ideas that have been prototyped are presented to users to get feedback. It is better to see how users interact with the prototypes instead of being asked about their experience. There are occasions where users express desires and opinions that are not in line with their actions when interacting with a system.
- **Implement**, where all the previous work is put together to produce an end product.

Design Thinking is not a linear process. On the contrary, Design Thinking encourages iterative work. This means that during the design process, we may need to empathize, define, ideate, prototype or test more than once. This depends on the size of our project and our team as well as our final objective.

The most important aspect to keep in mind from Design Thinking is that products and experiences are not created in one night. More importantly, even if you do have technical resources, the biggest challenge you have is not designing something right but designing the right thing. In other words, a beautiful interface may prove to be useless if it doesn't address the problems of your users. Design Thinking tries to address exactly that issue: by taking some time to understand your users, figure out their needs and think about solutions to fix their problems, you are already on a good path towards experiences that your users care about and will be impacted by. On top of this, in Design Thinking proposing ideas (good or bad ones) is not considered as a weakness but as a strength. Interesting experiences come from new and innovative ideas. Usually these ideas are considered crazy in the context of one product or instance but they are also the ones that drive innovation. By iterating many times on your products, through testing and receiving user feedback, you will eventually be able to refine those ideas.

Resources for Further Reading

https://designthinking.ideo.com/

https://dschool.stanford.edu/resources-collections/a-virtual-crash-course-in-design-thinking

https://www.nngroup.com/articles/design-thinking/

7.2. Principles of the Double Diamond Framework

Learning objectives:

Using and applying the design principles of the double diamond framework.

Content body:

In 2004 the Design Council presented an innovation framework, aiming to address complex design problems, also referred to as the Double Diamond. This framework is represented in the form of two rectangles (or diamonds). Each diamond introduces opportunities for divergent thinking, during which designers explore issues at greater depth or through various perspectives and then for convergent thinking, during which designers take more concrete and focused actions.
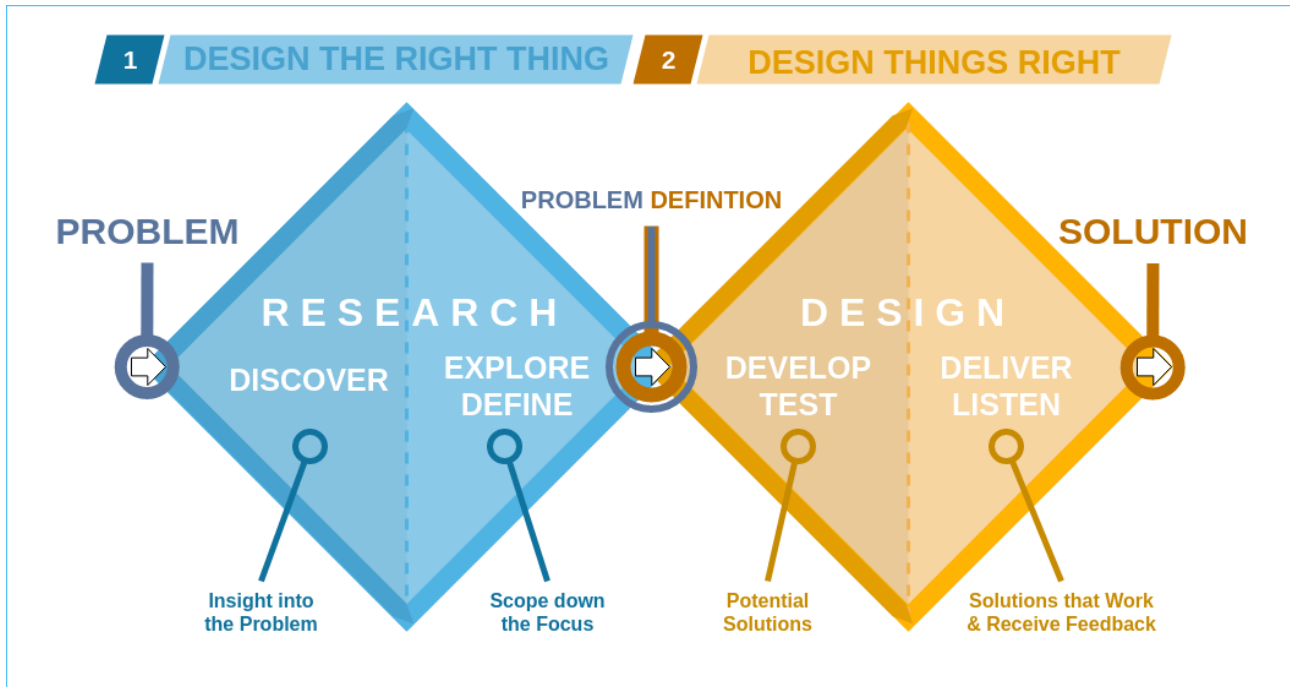
The Double Diamond describes four phases, which are:

Discover. During this phase designers and non-designers take time to better understand the problems they need to solve, gathering information about the organization, their customers, users, competition or any other important factor that will later help them come up with some solutions.

Define. Having collected different types of information from different sources eventually culminates into the definition of problems that need to be tackled by the design teams.

Develop. Based on previously defined problems, multidisciplinary teams (including designers and non-designers) come together, seek inspiration, brainstorm collectively or individually and co-create in a participatory manner.

Deliver. Since teams have come with a plethora of solutions during the Develop phase, at this phase, these solutions are tested. Solutions that don't work are rejected, while others are improved.

This is not a linear process as the arrows on the diagram show. Many of the organizations we support learn something more about the underlying problems which can send them back to the beginning. Making and testing very early stage ideas can be part of discovery. And in an ever-changing and digital world, no idea is ever 'finished'. We are constantly getting feedback on how products and services are working and iteratively improving them.

The design principles

The framework for innovation outlines four core principles for problem-solvers to adopt so that they can work as effectively as possible.

Put people first. Start with an understanding of the people using a service, their needs, strengths and aspirations.

Communicate visually and inclusively. Help people gain a shared understanding of the problem and ideas.

Collaborate and co-create. Work together and get inspired by what others are doing.

Iterate, iterate, iterate. Do this to spot errors early, avoid risk and build confidence in your ideas.

The methods bank

We have authored, adapted or adopted a portfolio of design methods which help our clients to identify and address their challenges and achieve successful outcomes. We have structured these methods in three areas to help them use the design process to explore, shape or build:

- **Explore:** challenges, needs and opportunities

- **Shape:** prototypes, insights and visions

- **Build:** ideas, plans and expertise

Creating a culture of success

The problems we face today require more than one idea, they require working with other organizations and supporting people to be part of the solution. As important as the process and principles organizations we adopt, is the culture of an organization and how it connects with citizens and partners.

Leadership is needed to encourage innovation, build skills and capability, provide permission for experimentation and learning. Strong leadership also allows projects to be open and agile, showing results along the way and being able to change.

Engagement is needed with people who are delivering the ideas and receiving them, but also with other partners who might have other ideas. Developing connections and building relationships is as important as creating ideas.

How do you use yours?

Reflection and iteration are at the heart of the framework for innovation. We're interested in finding out how you may have used the Double Diamond to solve a challenge, adapted it to meet your needs, or – like Design Council – added additional tools and techniques to achieve even greater results.

Contact us and tell us how you use yours or share any alternative approaches you are taking to tackle your challenges or if you'd like us help you apply the framework for innovation to your challenge.

8. Conclusion

Autism is described as a "spectrum" and is a lifelong developmental condition that impacts a person's behaviors, communications, learning and interactions, and how they experience the world. it's a congenital condition, and it lasts throughout their life.

In the last few years there has been an increase in the amount of empirical investigations, evaluating different intervention strategies to improve social behavior for individuals diagnosed with autism. These strategies include video modeling, peer imitation, social stories, and pivotal response training.
One such intervention is the Teaching Interaction Procedure (TIP).
The Teaching Interaction Procedure is a multi-step, systematic approach that has been used to teach a variety of skills for individuals diagnosed with autism spectrum disorder; however, this project focuses on the use of the Teaching Interaction Procedure to improve social skills. The TIPS project aims to improve the life and personal skills of children with autism and their families. We will use two digital tools, a digital

game and a digital comic strip. We have chosen these digital tools because it has been proved that gamification is a powerful resource to increase motivation and engage participants.

The teaching interaction procedure (TIP) is a systematic teaching package which consists of six steps (Phillips et al. 1974). It is a 6-step process in which the teacher identifies and labels the skill to be taught, provides a rationale tailored to the student, describes and models how to perform the behaviour, and then practices the skill with the student through role play. The teacher provides feedback including both praise and corrections as needed. Finally, the behaviour is observed in natural contexts to ensure its use in the student's most important social and learning environments.

The aim of a TIP is to facilitate the development of language and its appropriate use, expose clients to social reinforcement, and enhance a variety of social skills across various skill levels. Generally speaking, TIP's can be used to teach communication, emotional regulation, play, and friendship skills

The Teaching Interaction procedure is different from the Behavioural Skills Training, it includes a description of rationale to engage in the target skills. Inclusion of rational components may be important for the student to provide self-instruction to himself or herself to engage in the target skills when the teacher is not present. Thus, the rationale that the teacher provides should be potentially rewarding to the student.

Needs analysis:

Both teachers and parents make a comprehensive contribution pointing out *social, personal and life skills competences* desired to be in focus in the material to be developed during the TIPS project. There is a strong focus on communication skills such as understanding verbal and non-verbal communication signals, perception, recognition and control of emotions, self-awareness, relationship building and empathy.

A majority of the teachers believe that social skills can be developed or enhanced through digital games/comics, this statement is supported by the parents to an even higher degree.

Both teachers and parents to a large degree think there is a need for more diverse educational material, to inspire and train parents, how to support their children when it comes to the lack of the mentioned skills and competences.

Children with autism tend to learn faster through online visual resources as they comprehend images better than words. The TIPS project will meet all these needs, reflections and expectations through the development of digital material and the material described in the form of this curriculum

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