Social Thinking Metacognitive Strategies to Support Self-Determined Social Goals in Autistic Youth

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ABSTRACT

On any given day, the social mind is taxed with attending to and making sense of a myriad of social events. The social mind is at work when trying to imagine the experiences of others and their inner mental worlds, and is equally active when people seek to approach, connect with, and sometimes avoid one another. Ultimately, the social mind is responsible for thinking about (social) thinking, or social metacognition. Social metacognitive teaching strategies can be helpful for supporting social learners as they observe social landscapes, interpret what is observed to problem solve, or decide whether and how to produce social responses. This article describes how social metacognitive strategies from the Social Thinking Methodology have been used to support the self-determined social goals of two autistic students. Visual frameworks and their underlying theories are provided as evidence-aligned tools for supporting clinical journeys.

KEYWORDS: social metacognition, social competency, social thinking, social cognition, self-determination

Learning Outcomes: As a result of this activity, the reader will be able to (1) list the four parts of the Social Thinking–Social competency model (ST-STM) and explain the need to teach competencies below the "water line" rather than focus on social skills; (2) explain how teaching thinking with one's eyes is preferred and different than teaching eye contact; (3) explain why it is important to first determine the "situation" before progressing through the social emotional chain reaction; (4) describe two social metacognitive activities or lessons to foster insights into how the social world works.

On any given day, the social mind is taxed with attending to and making sense of a myriad of social events. Some events may be external or observable (e.g., conversing with others, taking turns, engaging in group work), while others are internal (e.g., reading subtle gestures, interpreting tone of voice, inferring meaning from context). As social beings, there is an expectation to be observers of one's surroundings and to reflect upon one's own actions, thoughts,[1] and emotions.[2] The social mind is at work when trying to imagine the experiences of others and their inner mental worlds,[3–5] and is equally active when people seek to approach, connect with, and sometimes avoid one another. Humans attend to and interpret the behavior of others while simultaneously attempting to shape others' impressions of oneself. This is all part of the broader, uniquely human social world where neurological, cognitive, affective, and linguistic mechanisms unite. And while these mechanisms for understanding and participating in the social world are effortless and intuitive for many, they are confusing and illusive for others. Whether neurotypical or neurodivergent, the social world is part of the human condition and involves both opportunities and varying expectations for participation.

In this article, we first describe the social world and social landscapes through the lens of social cognition. We argue that social cognition is the foundation for social metacognitive strategies, and is integral for building social competencies to meet one's own social goals. We then explore the relationship between social competencies and social metacognition through the Social Thinking-Social Competency Model and build a case for using this model to guide individualized teaching. We conclude with case studies of two autistic students to illustrate how social metacognitive frameworks from the Social Thinking Methodology (STM) can be used to help advance self-determined social goals.

SOCIAL WORLD AND SOCIAL LANDSCAPES

Like the physical world, the social world is vast, complex, and composed of a variety of landscapes. Social landscapes are made up of people, places, contexts, events, and emotions which dynamically shift as people share physical space, interact with one another, or interpret words or actions (including the social information in print or digital media as well as face-to-face interactions).[6] Every social landscape is accompanied by underlying social conventions or expectations based on who is present and what is happening. Making sense of the people, events, and conventions within each social landscape relies heavily on cognitive capacities such as metacognition.

Metacognition is the ability to think about thinking.[7] Metacognition, broadly speaking, refers to any sort of thinking about thinking such as reflecting about one's thoughts on math,[8] thinking about one's opinions on politics,[9] or ruminating on the nature or origins of emotions.[10] However, metacognition, from a social perspective (the focus of this article), refers to thinking and reasoning about one's own (inner) social thoughts[11] and feelings and noticing how these inner states are affected by others.[12] Metacognition has been referred to across the sciences by many different terms including social metacognition,[11–13] social cognition,[1,3,14] and theory of mind.[15] Although all these terms refer to thinking about thoughts, there is no singular consistent term across disciplines. For the purposes of this article, metacognition, social metacognition, and social cognition will be collapsed into the singular term: social metacognition.

SOCIAL METACOGNITION

Social metacognition can be thought of as occurring in two ways: introspective (thinking about and reflecting on one's own thoughts) and extrospective (thinking and considering thoughts about others).[16] This inward/outward distinction is relevant as clinicians attempt to better understand the thinking processes of clients or students with whom they work. On a practical note, and in line with our clinical experience, social learners who may not yet understand the concept of thoughts can benefit from basic teaching to learn, "What is a thought?" (rather than "others have thoughts" which is arguably more conceptually complex).

Other introspective and more developmentally complex acts include reflecting on thoughts to determine whether to share or conceal them,[7] giving or withholding feedback, or contributing thoughts to advance a group goal.[17]

Language (both verbal and nonverbal) plays an essential role as one learns to notice their internal thoughts with language (e.g., self-talk, self-coaching, self-reflection). Internal language helps people make sense of their own thoughts and experiences[18] and provides a vocabulary for describing one's own perspectives, intentions, and feelings. It can also be recruited as an internal coaching mechanism and used to explore different ways of thinking, knowing, and experiencing.

Of course, social metacognition may also be directed outward (i.e., thinking about or imagining the thoughts and feelings, actions, beliefs, intentions of others; the literature refers to this as mentalizing,[1] mind reading,[3] or theory of mind).[15,19] For neurodivergent people, challenges in this area may include problems reading social cues,[20] understanding unspoken social expectations,[21] and adapting social responses[5,22] in real time.[15] Relative strength in social metacognition is positively correlated with social abilities,[19] whereas challenges have been linked to struggles with adaptive behavior,[23] executive functioning,[24,25] behavioral regulation, and social functioning,[26] particularly in individuals on the autism spectrum.

SOCIAL METACOGNITION AND SOCIAL COMPETENCIES

The interdependence between social metacognition and social competencies is apparent when students are required to group problem solve[27]; infer others' actions, thoughts, feelings, beliefs, and intentions[5]; comprehend literature[28]; engage with others[22,29]; establish relationships; function in societies[30]; and decipher hidden social rules.[21] When students are thought to lack social skills, behaviorally based interventions traditionally focus on how a student is behaving, playing, or interacting. Remediation, from this lens, emphasizes changing, replacing, decreasing, or eliminating errant behaviors.[31] By contrast, social cognition or metacognitive teaching focuses on how to socially attend to contexts, people, and events, and interpret what is observed to problem solve or decide whether to produce (or inhibit) social responses.[6] This complex interplay between social metacognition and social competencies can be visualized in the four-tiered, recursive model called the *Social Thinking—Social Competency Model* (ST-SCM).[6] The ST-SCM is evidence-aligned and grounded in the seminal literature related to social information processing,[32,33] social learning theory,[34] joint attention,[35,36] social cognition,[1,37] metacognition,[7] and social communication.[38,39]

Fig. 1 shows the ST-SCM. This model is designed in the shape of an iceberg where the swoop on the graphic represents a "water line"
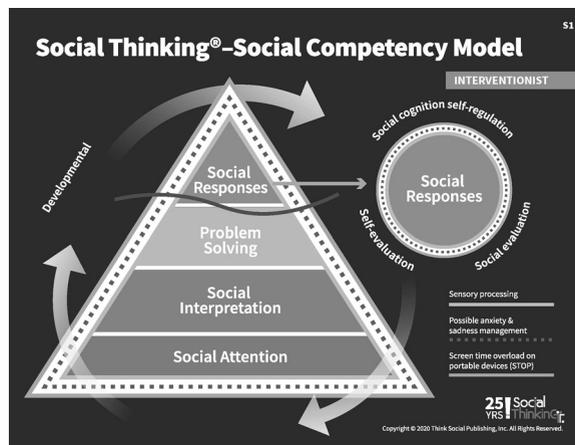

Figure 1 Social Thinking—Social Competency Model.

to distinguish that which is observable (skills) from that is not (thinking, interpreting, processing). The section above the water line (i.e., social responses) represents social behaviors, social responses, or what some might call social skills. The area below the water line represents the building blocks of social competencies (i.e., social attention, social interpretation, problem-solving). The arrow surrounding the model represents the cycle of attending, interpreting, problem-solving, and responding that repeatedly occurs across many social landscapes. In other words, as people move between people and places and events, their social mind attends, interprets, and problem-solves (to decide) whether and how to socially respond. This is true even when people are not actively engaging with others. Whether in face-to-face interactions, sharing space in a classroom, reading literature, or writing for a particular audience, people are continually moving through this social competency process. The four parts of the ST-SCM are defined later:

1. **Social attention**: the act of noticing or observing the people or agents, the setting or situation, the actions or events, nonverbal gestures (reaching, waving, turning, shrugging, etc.), and emotions.
2. **Social interpretation**: making sense of social observations. From a very young age, children are considering what others might be doing, thinking, and feeling as part of what they themselves are thinking and feeling. This is referred to as *self-otherness*, *we-thinking*, or *we-cooperation*.[40]
3. **Problem-solving:** processes for making social decisions. Problem solving includes considering potential dilemmas, points of view, one's desired goal, choices to accomplish that goal, and the consequences, to name a few.
4. **Social responses:** social behavioral actions or a set of actions (e.g., talking, joining/ leaving a group, writing) or refraining from an action (e.g., holding a thought in one's brain, not selecting or touching an item, avoiding a person or place) that can potentially influence or shape others' thinking and actions.

To the right of the iceberg is a circle "call out" indicating the presence of self-regulation in formulating or suppressing social responses. In other words, social cognitive self-regulation is the process whereby people collect and use their social cognitive knowledge to decide (self-regulate) whether and how to socially respond. Examples of social cognitive questions people might ask themselves include the following:

- Don't I know that person? Should I say hi?
- I wonder if I should try this.
- Am I making sense to this person?
- Is my topic sentence clear enough?
- Should I try to join that group?
- What part of my story should I tell the group, what part can I leave out?

These examples are important because there are no prescribed correct or incorrect social responses. Rather, social responses depend on the people, situation, and one's social goals. Notably, Fig. 1 illustrates the possible impact of extenuating factors on one's understanding/use of social competencies. These are represented by the dotted and solid lines around the iceberg and include sensory processing, anxiety, and digital overload (e.g., excessive use of screen technology including tablets, phones, and laptops). Although discussion of these factors is beyond the scope of this article, readers are encouraged to consider the possible impact these may have on how clients and students access and learn social information.[6] The ST-SCM is intended as a visual representation of the social competency process for all social learners, both neurotypical and neurodivergent.

ACADEMICS ARE ROOTED IN SOCIAL COMPETENCIES

Students are expected to attend to, interpret, problem solve, and respond to social information throughout the academic day as they work in peer-based study groups, attend school events, express opinions, write essays considering others' perspectives, and interpret intentions of characters in literature. We argue that the four-tiered ST-SCM model described earlier is relevant across the academic curriculum to

support reading comprehension, writing for various audiences, working in learning groups, and asking for help. In fact, many academic standards have embedded socially based benchmarks that require understanding different points of view (perspective taking), describing characters and emotions (social landscape), and making inferences (interpreting actions, inactions, predicting). Speech-language pathologists (SLPs) can use this model to better understand the unique strengths and needs of individual social learners and describe the relationship to academics. The latter half of this article will highlight two case studies in which the ST-SCM was used to (1) more deeply understand the individual's social metacognitive learning characteristics and (2) tailor plans to support student's self-determined social goals.

SOCIAL LEARNER CHARACTERISTICS

Few would disagree that those with social learning differences have unique characteristics and heterogeneity in their strengths and challenges.[41] In relation to the autism spectrum, the DSM5[42] modified previous diagnostic criteria to delineate one label with three levels of support. A diagnosis of autism, by definition, implies a vast range of learning characteristics in social cognition. Yet understanding the individual's learning characteristics can be extremely helpful for targeted, effective, and sound teaching or treatment planning. One way to frame different social learning styles is to think about distinct learning characteristics. In our broader work, pilot studies have identified at least five different social cognitive learning styles. Two of these are described here to elucidate the application of social metacognitive teaching in the following case examples.*

Table 1 shows the core characteristics of two social cognitive learning styles. The left column lists strengths, whereas the middle and right-hand column describe characteristics related to the first two levels of the ST-SCM: social attention and social interpretation.

The following two case studies examine a brief snapshot of two different treatment journeys while highlighting the social cognitive

Table 1 Social Cognitive Learning Characteristics of Two Social Learning Styles

Challenged social communicator	Social attention[a]	Perspective taking for social interpretation[b]
• Strong knowledge in facts and/or details in areas of interest. • Uses basic language. • Strengths in decoding and memorizing. • Thrives with routines. • Visual learning strengths over auditory	• Mostly unaware of others' intentions. • Support needed to socially attend to people, places, actions, and feelings. • Stronger nonsocial attention to interest-based actions or details	• Currently does not understand the abstract concept of thoughts and thinking in self or others
Emerging social communicator	**Social attention[a]**	**Perspective taking for social interpretation[b]**
• Cognitive strengths. • Academic strengths across fact-based subjects. • Solid language use related to vocabulary, structure, and grammar	• Social attention to the situation, people, and places. • Strong observational abilities in areas of interest	• Differences and/or challenges in interpretation of situations, people's actions, and their feelings. • Aware of other's thoughts and feelings, but through one's singular perspective

[a]Social Thinking—Social Competency Model (ST-SCM): social attention—observing situations, people, actions, events, and feelings.[6]
[b]ST-SCM: social interpretation—making sense of own and others' thoughts, feelings, actions.[6]

learning styles of a challenged social communicator (CSC) and an emerging social communicator (ESC). Each case will show how an understanding of a learner's social learning characteristics can be coupled with their self-determined social goal(s) to individualize supportive teaching. For reference, both students received their primary education in the mainstream classroom, and both received varying degrees of special education and SLP support. The social metacognitive tools and strategies were from the STM.

SOCIAL THINKING METHODOLOGY

Although there are numerous programs using behaviorism to teach social skills to neurodivergent individuals, it has only been in the last two decades that social cognitive or metacognitive programs have become more prolific.[43–50] The STM is one example of a social (meta)cognitive methodology developed for both neurodivergent and neurotypical social learners.[51,52] Founded 25+ years ago, the methodology is composed of evidence-informed and evidence-based concepts, frameworks, and strategies to support social attention, self-awareness, social metacognition, social communication, executive functioning, social and emotional awareness, social responsibility, and social competencies.[51,53] Unlike traditional behaviorally based social skill programs focusing on teaching social rules and social behaviors, the STM emphasizes (1) first understanding the individual's social learning characteristics, including their social desires or goals; (2) teaching aspects of how the social world works based on their goals; and (3) teaching strategies for navigating, using social cognitive self-regulation, to make gains toward one's goals. It is important to acknowledge the emphasis on teaching social concepts about the social world or filling in knowledge gaps related to the individual's self-determined social goals *before* teaching strategies to navigate or self-regulate. These distinctions are important for differentiating traditional behaviorally based social skills programs from the STM and related metacognitive approaches.

The STM is based on foundations in metacognition (thinking about thinking), and social metacognition (thinking about social thinking).

The frameworks, strategies, and lessons require students/clients to explain abstract concepts like thoughts/thinking, inferences, predictions, and perspectives. The methodology is not designed for, nor is it the best fit for those who have yet to develop fluid or generative language systems as many activities require extensive language. Generative language systems that *are* a fit for the methodology include fluent spoken or written language, sign language, or augmentative systems. Components of the methodology are also not well suited for those with significant intellectual challenges, given the metacognitive emphasis and cognitive demands. However, there are many other approaches, strategies, and tools that are useful resources for these populations.[54]

In the following case studies, age, grade, gender, and diagnosis are the same so that social metacognition is the differentiating characteristic.

CASE STUDY 1: DAKOTA (PSEUDONYM)

Dakota is 11-years-old. He is autistic and participates in two different classrooms where an assistant provides support in general education (core academics) and special education (social, specialized academic and language-based support). Dakota's expressive language abilities, as measured by standardized testing, are at the 25th percentile, while receptive language abilities are at the 8th percentile. Additional testing showed significant challenges in inferencing, predicting, determining causation, and problem solving. According to parent report, Dakota has always been talkative, fluent in decoding words, and loves making lists of amphibians, crustaceans, fish, and other sea life. He carries this list wherever he goes and reads it from start to finish to teachers, peers, and strangers, regardless of whether they are attending to him (and may be disinterested). His dad worries that Dakota will approach almost anyone to talk about sea creatures and he appears unaware of whether he has previously shared the same information with specific people, often repeating facts to the same person. His teachers report that although Dakota decodes words at his current grade level and above, he struggles to interpret the meaning of what he is reading. His teachers and parents agree that

he has great difficulty comprehending abstract information including reading fiction or comics, watching movies, and making sense of most conversational discourse.

Dakota is very friendly and enjoys simple repetitive play routines such as hide-and-go-seek and tag with his 8-year-old twin sisters. He has a strong sense of rules and structure and gets upset if he feels someone is breaking a rule or if the schedule changes, indicating rigidity around play and a need for sameness. He is the most productive when he has a clear list of school tasks or chores to accomplish. While he enjoys checking off tasks as he completes them, he does not ask for help or seek comfort if there is a disruption in the routine or when distressed if predictable events change (i.e., shampoo bottle is empty, mail isn't arriving because of holiday). Dakota is highly detail-oriented and does not see how small tasks go together in a larger scheme. For example, Dakota follows checklists for gathering materials for classroom activities (e.g., art project or writing activity), but may not understand what to do with the materials without prompts or support.

Dakota's classmates are aware of his learning differences and are, for the most part, supportive and inclusive in activities. However, Dakota appears mostly unaware of the presence of his classmates or their actions without explicit direction from the classroom assistant (e.g., "Look at those kids over there. What do you think they are doing?"). While Dakota always chooses to spend lunch in the biology laboratory with the science teacher, he recently asked his teacher to find other kids with whom he can eat lunch. His support team organized a peer lunch rotation schedule, but later reported that Dakota appeared outwardly uninterested in the peer(s) and routinely left the planned lunch dyad to seek an adult with whom he could talk about his interests.

At home, Dakota's mom reported that he loves to play sea life "go fish" with his sisters. However, his siblings complain that it's "too easy and no fun because Dakota shows his cards and tells us what he has!" Dakota's mom confirmed that he "doesn't always notice" and accidentally lowers his cards even when reminded to "hold your cards up." The clinician explained that hiding one's cards is a complex perspective-taking task, requiring knowledge of the concept of thinking and thoughts, how to keep some thoughts private, how to read plans, and how to maintain social attention. Also, the point of most card games is to keep other people from knowing what is in one's hand and/or one's plan (and concealing the identify of cards). This meant that reminding Dakota to "hide his cards" was ineffective because it was an attempt to teach a rote "skill" rather than teaching the underlying reasoning behind the act; hiding one's cards (thoughts) is how to play (and win) the game. As a result, Dakota's siblings began to opt out of playing cards with him. Dakota's mom reported that he was not only confused but deeply saddened by this. His confusion ("why won't they play?") combined with frequent tears became the impetus for an additional social goal of helping Dakota learn to hide his cards/thoughts to reestablish card play with his siblings. From the family perspective, protecting Dakota from loneliness and isolation at home as well as school while valuing his goals and desires was critical for his psychological well-being.

It is worth restating that Dakota expressed two clear social goals (someone with whom to talk and eat lunch and card time with siblings) through his voice of advocacy and emotion expression. This is an important point because many students may not respond to queries like, "what do you want to work on?" or "what are your social goals?" but they *do* have social desires and goals. Recognizing requests such as this and valuing student's comments and feelings allows support teams to develop individualized, personalized, and meaningful social learning plans.

Dakota's social learning style is representative of CSCs (see Table 1). Core characteristics include spikes of knowledge in preferred areas of interest that may change across time but are usually related to information that is concrete or fact-based. Teaching concrete-based learners like Dakota requires the interventionist to consider, and capitalize on, learning characteristics such as skills in specialized areas: the ability to decode or remember and state fact-based information. Some concrete-based social learners also demonstrate visual learning strengths relative to auditory processing, but not universally. Dakota, like many students,

thrives with structure. Structure helps mitigate his anxiety (e.g., involving transitions) and he finds comfort in predictability and pleasure in tasks based in routines and redundancy. These characteristics were recognized as strengths and, as such, were used to support his social goals. For example, Dakota's knowledge and strength in memorizing sea life facts remained highly motivating, so personalized activities were developed with that interest in the forefront.

Dakota: using the ST-SCM to teach social attention and social interpretation. Designing the intervention journey for Dakota was informed by (1) his social goal(s), (2) the ST-SCM to focus teaching, and (3) his unique social learning characteristics. A six-part teaching journey was then designed beginning with exploring the concept of thoughts/feelings from Dakota's perspective (e.g., I have my own thoughts and feelings) and progressing to more abstract concepts about others' perspectives (e.g., I can make smart guesses about others' thoughts, feelings, and knowledge). *Sample lessons, teaching templates, and instructions from Dakota's support plan are included in* **Appendix A**.

Dakota: summary. We believe that the purposeful consideration of Dakota's social goals and social learning characteristics was critical in designing an effective and individualized intervention plan. Dakota benefitted from the use of visual supports and metacognitive vocabulary which served as building blocks to support his social goals. The journey required careful, reasoned, and deliberate instruction over many months, beginning with teaching social attention to his own and others' thoughts and feelings. He learned that his thoughts were, at times, different from others and at other times, the same. He learned to be an observer of people and their actions across social landscapes. Once he learned to socially attend, he began to make guesses about others' actions and emotions.

At school, Dakota maintained a keen interest in sea life but began to use a visual template to speculate about which of his lunch partners, teachers, and family members might already know about his particular sea life facts. He learned to make smart guesses about whether someone is interested and learned that other people's brains have different facts they love to think and talk about too. In this process, Dakota discovered a new love of baseball cards, which just happened to be the strong and deep interest of a lunch peer.

At home, Dakota gradually figured out that his siblings didn't know what cards were in his hand (if he held them up), but they already knew about his sea life facts. These "real-time" perspective taking acts, based on parental reports and clinical observations, were major milestones that filled both a practical goal (joy in playing with siblings) and a social metacognitive goal (understanding basic perspective taking). Dakota was not asked to conform to social norms he did not understand, but instead acquired the social information to fill in social knowledge that he did not previously intuit.

CASE STUDY: LI (PSEUDONYM)

Li is a 10-year-old autistic male who has always excelled in the sciences. He attends gifted and talented classes twice weekly where his aptitude in science and technology has made him an academic standout. Basic expressive and receptive language skills, as measured by standardized testing, are in the high average to superior range, with vocabulary, sequencing, and logically determining cause and effect being among the strongest. His vocabulary, language structure, and grammar are at grade level or above, but his teacher reported that Li struggles to write personal essays that involve assigning voice and perspective to characters and to summarize what he has read in a succinct manner (especially when the content has a socially loaded theme). Li considers himself a gifted scientist and he excels in asking scientific questions, gathering evidence, and stating conclusions. In science class, he believes he knows the answer to the daily quiz and shouts it out before others have a chance to respond. This occurs regardless of repeated reminders from his teacher to "raise your hand and wait." He routinely tells other students they are "blockheads" or "dummies" for not knowing answers and does not appear to notice verbal or nonverbal cues to indicate his peers' hurt feelings or anger. He struggles to work with peers in small groups, including science laboratories.

His mom and teacher have talked with Li to explain that his words and actions can be hurtful. Li responds by justifying the accuracy of his comments ("well they are dummies if they don't know") or actions ("I got to the supply table first, so I grabbed [from another] what I needed"). And yet, Li laments daily to his mom and teacher that "no one will play strategy cubes with me at lunch or work with me in science even though I am the smartest!" Like Dakota, Li expressed his self-determined social goals to the adults in his world (i.e., wanting to play and work with others). He also expressed frustration and confusion as to why he is not a preferred peer partner. Li's peers describe him as "pretty smart but not at all friendly" and "sometimes mean." In terms of the social world, Li is an observer of people, places, and events and knows that people have thoughts and feelings that are different from his own. He can intellectualize that people can trick others and lie, but rarely detects when others are lying or tricking him. He tends to believe what people say, so he expects that others will believe him too. On several occasions, he has attempted to play tricks on peers but then expressed frustration when they were able to quickly recognize his intentions. Li "despises" peer-based work groups, given the expectation of collaboration. Li's cognitive academic strengths can, at times, put him at a social disadvantage, as others assume he understands the social expectations across social landscapes. In other words, both peers and teachers expect that his social knowledge should match his academic knowledge: it does not.

Li's social learning style is representative of ESC (see Table 1). Core characteristics include strong intelligence with relative strengths in academics that are factual (science, history, math, spelling, vocabulary, etc.). From the lens of the ST-SCM, Li socially attends to people, actions, and their feelings across social landscapes, but his social interpretation is primarily from his singular perspective. Although Li knows that others have thoughts and feelings, he does not intuitively grasp that we all impact one another. Li problem solves how or when to socially respond, again based on his singular viewpoint which means that he argues, from his perspective, as to why his responses are

correct. This has led school staff to conclude that Li simply needs to be reminded of the school rules and have enforced these rules, which have only made Li more frustrated.

Li has unique learning characteristics that focus on science-based thinking, including collecting what he calls "data points" to evaluate truth. He has strong fact-based observational skills and a nascent desire to relate to peers. These characteristics were recognized as strengths and, as such, were used to support his social goal. For example, Li's strengths in data collection remained highly motivating, so personalized activities were developed with that interest in the forefront.

Li: using the ST-SCM to guide lessons. Like Dakota, designing the intervention journey for Li was determined by considering (1) his social goal, (2) the ST-SCM to focus teaching, and (3) his unique social learning characteristics. Li's journey began by first exploring his expectations of others. In the STM, this is referred to as *inside out* teaching, and it involves helping the student recognize that they have clear expectations of how other people should act or react in situations. Inside out teaching also allows social learners to have a say in their own social learning process by building on their perspectives and expectations of others first, rather than vice versa. Li voiced concerns about how the social learning sessions would be structured given his past negative experiences with "social skills training" using applied behavioral analysis (ABA). Li needed assurances that lessons and activities from the STM would not focus on making him behave for others, but instead would focus on helping him move toward his stated goals. To do this, the clinician framed lessons to teach about the social world around his strengths and interest in scientific methods. Although Li was *initially* not motivated by the idea of learning about shared expectations in groups, he *was* motivated to conduct his own mini-science experiment about how kids move in and out of groups and the nature of group expectations. In essence, lessons were designed around encouraging him to collect his own data about proposed social hypotheses. Although Li's treatment program was much more comprehensive than described here, a summary of a three-part metacognitive mini-teaching process

and sample instructions for implementation are included in **Appendix B**.

Li: summary. We believe that the purposeful consideration of Li's social goals and social learning characteristics were critical factors in designing an effective and individualized intervention plan. Li benefitted from metacognitive visual teaching frameworks that allowed him to use his strengths and interests in science-based data collection. Li learned to explain social phenomena from his perspective but realized that the process also works in reverse; others notice and have thoughts and feelings about what he says and does too. This was an epiphany for Li one day while using the social emotional chain reaction (SECR) visual framework (see Fig. 2) to interpret what happened during a social situation in biology laboratory. Li used the SECR to "talk through" how this social situation progressed through the five gears of the chain reaction. He began by describing the situation (gear one) as laboratory experiment with an assigned laboratory partner. Li indicated that he was the "DOer" (gear two) and his laboratory partner was the "other person" (gear three). Referring to the second gear on the SECR, Li explained that once he saw who his laboratory partner was he said, "I can't believe I have to work with this blockhead" [unexpected behavior based on the situation]. He then stated that his laboratory partner, referring to the third gear, was probably angry and then reacted by "flipping me off and leaving" (gear four). Li concluded that *he* was the one who ended up really frustrated and confused (gear five) because he needed a partner to complete the assignment.

Li's use of the framework to verbally process as a way to understand what happened in this social situation was the first time he showed an understanding that what he does and/or says might impact others' thoughts, feelings, and reactions. He also stated the connection between another's (re)actions and his own thoughts and feelings. As a result, Li no longer says derogatory comments about his peers aloud, but he does report (privately to his mom) that he still doesn't understand why "some people are dummies." This was considered a positive step toward meeting his social goal.

Li also learned that he already had a core set of social knowledge about how groups work, and that social observations could be used to build this knowledge base. He learned that interacting in face-to-face situations has a somewhat predictable structure, and this structure can be used to help him move in and out of groups. Li was motivated to participate in this social learning process that built upon his strengths as a scientific thinker and also focused on supporting progress toward his social goal.

At school, Li began practicing and implementing visual frameworks (e.g., four steps of face-to-face communication) to determine how to enter a group activity. He started with simply thinking (Step 1) about who was in the group,
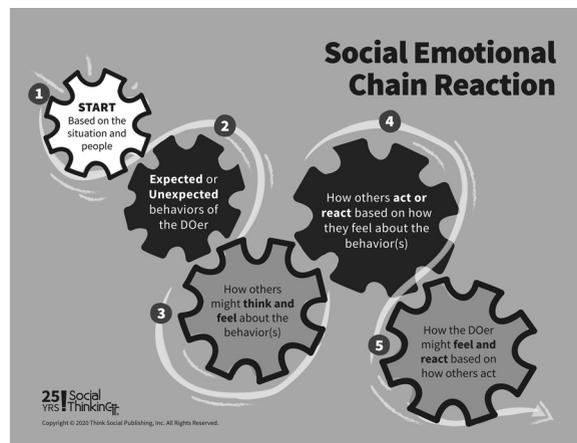
Figure 2 Social emotional chain reaction (SECR).

the group dynamics or hidden expectations, and the rules (stated expectations) of the game. He eventually moved his body close enough to the group to show his intention to communicate (Step 2) and used his eyes to gather information (Step 3) about when it would be a good time to ask the players (Step 4) about joining the game. To be clear, this was not a quick process. Li took several weeks to plan how to approach this group, but he now participates in both strategy cubes and other board game groups regularly. Throughout this social journey, Li was not asked to conform to social norms that he did not understand. Rather he acquired the social information to fill in social knowledge that he did not previously intuit. In fact, Li continued to be the driver of collecting and analyzing data to build his knowledge base about the social world to make gains toward his own social goals.

THE BIG PICTURE

Understanding social learning characteristics, listening for the unique ways that students express their social goals, and teaching how the social world works from the student's perspective are critical for developing personalized social learning supports for neurodivergent learners. These clinical journeys represent how two individuals, who are similar in age, gender, and diagnosis, are very different in terms of their social metacognitive learning needs. The case studies also illuminate the importance of recognizing self-determined social goals,[52] breaking social learning into smaller pieces, and then gradually building social competencies based on "where the learner is." This manner of teaching provides the foundation for future learning and possible social connections. Social competencies are not about producing social skills in one particular way. Instead, they represent steps that individual social learners can take to meet their social goals. The emphasis is on teaching social information (how the social world works) because information is power.

These support plans also show the importance of teaching strategies grounded in thinking about thinking; thinking about social thinking; and understanding the impact of thoughts, emotions, self-reflection, and social cognitive self-regulation when moving through social landscapes in the social world. The ST-SCM is one model to help SLPs and other interventionists systematically introduce metacognitive strategies in multilayered processes that can build a foundation of social knowledge. Social knowledge must come before social "doing." Social metacognitive teaching takes time because the social world is an enormous place with many complicated social landscapes.

Unfortunately, some social strategies to support both neurotypical and neurodivergent social learners have been misinterpreted and/or misused. For example, the SECR as described in this article should never be used to make people "conform." Instead, imagine the chain reaction from one's own perspective first: what others do or say has an impact on how you think and feel, which impacts how you act/react, and your action/reaction impacts how you feel about the situation. The SECR is a visual tool to give the social learner information about the social world works for all of us. Curiously, we expect schools to teach math, science, and historical information to students, but are uncomfortable or reluctant to teach social information. We argue that if a student states a desire for information to better understand the social landscapes of the hallway, playing with peers, hanging out in groups, or eating lunch with others, and we pass on helping them, then we have failed in supporting their desires and/or social goals. Herein lies the paradox as social emotional learning professionals: we give students information to help them meet their academic goals, we give employees work-place information to do their jobs and meet employment goals, and we give our children information on how to grow up to be good human beings and reach for their life goals. At the same time, we argue about whether we should teach social information and share knowledge when clients/students state their social desires. Information is power and, in the case of these two students, social information was the tool to promote both autonomy and overall well-being.

CONFLICT OF INTEREST

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APPENDIX A DAKOTA'S TREATMENT PLAN: SIX PARTS FOR TEACHING THOUGHTS AND FEELINGS OF SELF AND OTHERS

Part 1: I have my own thoughts and feelings

- Enlarge and print a photo of the student or use a digital picture on a tablet or computer. *Note*: If the student is highly distracted using technology, then draw a stick figure of a person on butcher paper and label the top of the page with the child's name.
- Draw a vertical line down the middle and label the left half with "things I love to think about" and the right half with, "things I don't like to think about."
- Draw/add two or three thought bubbles on each side of the paper. See Fig. 3 for an example of how this might look.
- Clinician/parent draws a similar stick figure (or picture) representing themselves and labels it with their name, draws a line down the middle, and labels the two halves with "what I like/don't like to think about."
- Introduce the concept of thought bubbles ("thought bubbles are what we draw on paper or see in comics to show what people are thinking about in their brains"). Or explore what they already know about thought bubbles if they are familiar with comic books and cartoons. If not, point to the thought bubbles drawn on the butcher paper.

- Begin by focusing on left side of the diagram. If the student is easily distracted, then fold the paper in half to show only the left side.
- Ask, "what do you like (like/love) thinking about?" [Dakota said, "Sea urchins!"] Write the response in their thought bubbles. Clinician writes their own "likes" in their image's thought bubbles.

If the student is unable to generate what they like to think about, then use what is already known about the student. For example, "I hear you talking about 101 Dalmatians a lot. Is that something you like to think about? Can we put that in your thought bubble as something you like to think about?"

- Draw a large heart in the middle of the image with enough room to write words or add emojis on the left and right side of the vertical line down the middle.
- Ask, when you think about _____ ["sea urchins"], how does that make you feel? [Dakota responded with, "excited!!"]

If the student has difficulty generating feeling/emotion words, then use an emotion/feeling word bank to give choices, "I know you like thinking about sea urchins. You seem happy and excited. Is that right?"

Note: If the student has yet to develop an emotion/feeling vocabulary, then stop the activity and teach this first.

- Write emotion words inside the left half of the heart image as the student states their feeling/emotion connected to their thoughts. This is a concrete way to build
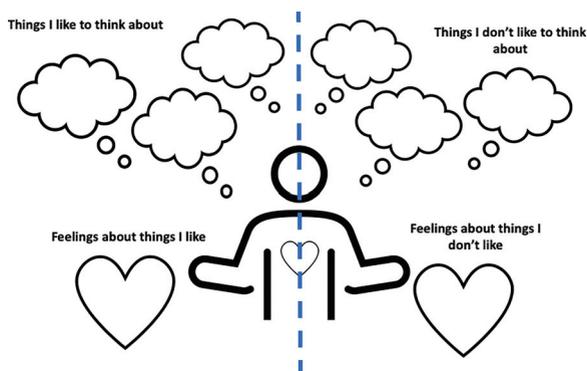

Figure 3 Teaching template: I have my own thoughts and feelings.

the connection between thoughts and emotions (e.g., I like to think about whales. It makes me feel calm).

- Repeat this activity to fill two or more thought bubbles and emotion words on the left side.
- Move to the right side of the paper, "what I don't like to think about" and repeat the activity.
- Make sure to take time to allow for students to explore their own thoughts and feelings over the _course of several sessions_. Reminder: If students are unaware of the meaning of thoughts, thought bubbles, brains, emotions, or feelings, then back up and teach these core concepts first. Don't move to the next part until the student understands the concept of what they like/don't like to think about and how it makes them feel.

Part 2: Others have thoughts and feelings too. All people have thoughts and feelings. This focuses on teaching the student that other people can have thoughts and feelings too. For Dakota, this was the beginning of realizing/seeing that not everyone had sea life listed in their thought bubbles.

- Use the same activity listed in Part 1 but focus on talking about the thoughts and feelings of family members or people who work closely with the student.
- Once the likes/dislikes papers are completed, hold them side by side.
- Discuss and/or point out how some things that others like/dislike to think about are similar and different.
- Discuss and/or point out how feelings are similar or different between people.

Part 3: I can use my eyes and thinking to figure out what I know. The focus of this activity is to teach social observation using one's eyes (and ears and brain) to gather social information. This is called _think with your eyes_ and is part of the core ST vocabulary.[55] This also introduced social interpretation of social observations.

- Introduce the concept of "knowing" by teaching that seeing, smelling, touching, or experiencing something helps one _know_ about something.

- Explain that our brains hold lots of facts about what we know.
- Explore what students already know about themselves. Talk about and make a list related what they know based on questions.

Ideas for questions include but should not be limited to: What is your middle name? Who is in your class? How many people are in your family? What is on your daily schedule? What are the names of your pets, siblings, cousins?

Keep this list for the next step.

- Draw a large brain on a whiteboard or paper and label it with the student's name: "_____'s Brain." Write the list of words or phrases inside the brain or use pictures to show what they already know about their world.
- Use cognitive verbs (e.g., know, guess, remember) while talking about what they know. For example, "You know your middle name," "You remembered the names of two kids in your class."
- Introduce "thinking with your eyes" to gather clues as a _Social Detective_.[56]

Ask the student to scan the room (think with your eyes) to determine _who_ is in the social landscape (e.g., teacher, students, principal, guest, librarian).

Ask the student to think with their eyes to gather clues about _what_ is happening in the social landscape (e.g., kids are working in groups, teacher is talking to one student, kids are lining up for lunch).

Walk with the student to the library and think with their eyes to gather clues about what clues help us to know this is a library? (books, checkout counter, librarian). Gather other clues about the hallways, multipurpose room, playground, etc.

Write these clues in the large brain or discuss what the student now knows.

- Extend: Clinician draws a large brain on the white board that represents their brain and what they know. Add words or pictures to show the student they now share knowledge about shared experiences or conversations.

For Dakota, this was the first time he visualized that other people had sea life facts in their brains, which naturally led to part 4.

Table 2   Three Teaching Templates: Who Knows What?

1. Who knows what you had for breakfast?

Person	Did they see me?	Did they do this with me?	So, do they know?
Mom	Yes	Yes	Yes
Teacher	No	No	No
Dad	Yes	No	Yes/Maybe
Me	Yes	Yes	Yes

2. Who knows where you keep your toothbrush?

Person	See me put it away?	Use the same bathroom?	Do they know?
Store clerk	No	No	No (why)
Teacher	No	No	No (why)
Mom	Yes	Yes	Yes (why)
Mail carrier	No	No	No (why)

3. Who knows my sea life facts?

Person	I told them?	Saw my list?	Do they know?	Should I show my list or tell them?
Biology teacher	Yes	No	Yes (why)	No (why)
Teacher	Yes	Yes	Yes (why)	No (why)
Mom	Yes	Yes	Yes (why)	No (why)
Grandma	No	No	No (why)	Maybe if she is interested

Part 4: Different minds know different (and sometimes the same) things. Understanding what people know and don't know requires the ability to first realize others have different thoughts based on experiences and knowledge. Table 2 shows a series of three different teaching templates, each of which can be used to help the student develop an understanding of different people's perspectives and knowledge. While the responses in the tables are specific to Dakota, the templates and questions can be recreated and modified for individual students. Keep in mind that teaching about "who knows what" requires both social attention and social interpretation from the first two layers in the Social Thinking – Social Competency Model.

Who Knows What I Had for Breakfast?

- The uppermost template in Table 2 shows four columns where the first column and rows are composed of people who are very familiar or live with the student. The last row in column 1 includes the student's name or "me." Other headings include column 2 ("Did they see me?"), column 3 ("Did they do this with me?"), and column 4 ("So do they know?"). Each of the rows in this first template contains Dakota's yes or no response based on "Who knows what I had for breakfast?"

This template and the following two templates can be recreated using any word processing program to make a four- or five-column table, leaving the yes/no rows blank. When teaching using these templates, begin by asking the question at the top, "who knows what you _____?" and follow up with a yes/no question, "Does your mom know?" and so on. Record the student's answers in the cells below and then discuss what the student knows versus what others know.

Who Knows Where I Keep My Toothbrush?

- The middle template in Table 2 shows four columns with the first column and includes

people in column 1 who are both *inside and outside* of the family. Column headings include column 2 ("Did they see me?"), column 3 ("Do they use the same bathroom?"), and column 4 ("Do they know?"). Column 4 also asks "why do they know?"

This template is an example of how to gradually expand to people outside the student's immediate family and allows for deeper questions about "why" a person knows or doesn't know the information. This middle template contains Dakota's yes/no responses based on the question. In the same manner as before, begin by asking "Who knows where you _____?" and follow up with a yes/no question, "Does the store clerk know?," "Does your teacher know?," etc.

- If the student is unsure about whether the person knows or not, explain using metacognitive vocabulary in a sentence, "Mom *knows* because she uses the same bathroom, and she sees you with your toothbrush. The mail carrier doesn't *know* because she doesn't use the same bathroom and has never seen your toothbrush."
- Remember, "why" questions are more complex developmentally, so age and developmental level should be part of the consideration.
- Expand the activity or change the question at the top of the template to include:
- Who knows what you did today in school? Why?
- Who knows what you had for lunch? Who doesn't know? Why?
- Who knows what's in your backpack? How or why would they know?

Who Knows My Sea Life Facts?

The bottom template in Table 2 is specific to Dakota's intense area of interest, "Who knows my sea life facts?" and was included as a way to begin the process of teaching Dakota that some people may already know his specific sea life facts. This was a building block lesson for future learning about eating lunch with peers and figuring out what they already know or don't know.

This template includes five columns: column 1 ("I told them"), column 2 ("They saw my list"), column 3 ("Do they know?"), and column 5 ("Should I show my list or tell them?"). Each of the rows in this template contains Dakota's yes or no response based on the question at the top of the column. This template increases the complexity of the task by including two columns asking for evidence of "how/why" a person might already know something.

Part 5: I know, so I can make a guess. Once students understand what they know and why, as well as what others know and why, they can begin to make guesses or "smart guesses"[55] to make predictions.

- Remind the student they already know a lot. Refer to the large brain on the whiteboard or butcher paper that contains what they know based on what they've seen and done.
- Make or show a calendar, schedule, routine board, to show examples of what they already know.
- Teach that "making a guess" is thinking about what might happen based on what is already known. For example, "You already *know* what you do every morning. You probably *remember* about yesterday, so what is *your guess* about what you will do today?"
- Celebrate the student's ability to guess about what is not clearly stated!

Possible expansion or extension activities:

- Ask students to make guesses about what is happening around the house, in books, or in upcoming activities. One example is to ask them to look at ingredients placed on the counter (e.g., spaghetti pasta, tomatoes, bread, onions, butter, spices, vegetables) and then ask them to make a guess based on what they see. For example, "You see the food on the counter so what is your smart guess about what's for dinner?

Part 6: I can make "smart guesses" about others too.

- Remind the student they already know how to make *smart guesses* based on gathering clues.
- Explain that these clues can also help them figure out (predict) or *read the plan*.[55]

- Act out a series of actions designed to allow students to gather clues to figure out or read your plan.

For example, reach for the door handle but stop your action just short of touching the door.

Ask them to gather clues and make a guess about your plan (guess: open the door).

- Expand the notion of *smart guesses* to include emotions.

Explain that people can sometimes figure out or make smart guesses about how others feel inside just by gathering clues from their faces and bodies and words. Start by using photos or pictures of people (in context or in a social landscape) who are showing emotions with their face, body, or words. Avoid using emotion faces or emojis in isolation.

Expand to real-time social observation and interpretation about actions and emotions.

For example, look at your watch and make a sad expression, drop your shoulders, sigh, and say "that's a bummer, our time is up" or use vocabulary that expresses this same idea.

Ask the student to make a smart guess about why you looked at your watch [guess: wondering about the time, checking time, thinking about time].

Ask the student if they noticed the sigh, dropped shoulders, frown, and the words that were said. Repeat it if they didn't notice.

Have them make a smart guess based on the face, body, words, gesture clues.

Talk through what happened after their guess, "yes, I looked at my watch and was thinking about running out of time. It made me a (disappointed) because it's time to go. I also sighed and frowned and said words that gave you clues!"

Discuss that people may not always say words and show their emotions on their face or body. Remind them it takes practice but learning to be a strong observer or social detective can help.

- Expand to academics. Teach that people figure out thoughts and feelings of characters in stories based on the words and images in the book. Figuring out the main idea of abstract literature, understanding the motive/intentions of characters, and making

guesses can all be possible by attending to and interpreting clues provided by the author.

APPENDIX B ASPECTS OF LI'S TREATMENT PLAN: THREE PARTS FOR EXPLORING HOW GROUPS WORK IN THE SOCIAL WORLD

Part 1: Inside Out Teaching: Exploring Expectations: *Do people have expectations of others?* The clinician began with an initial hypothesis for Li to evaluate: "We all have expectations for how others behave. Is this true or not true?" Given Li's scientific thinking, he proposed making a survey to poll family and adults (not peers) about whether they believed this to be true or false. He presented his findings (which affirmed the hypothesis) and agreed that he too has expectations for how others behave. He clarified in his findings that babies and little kids should "get a pass" because we just "expect them to be annoying" and "they don't know better." Armed with now knowing the validity of this hypothesis, the clinician proposed another: "People also have thoughts/feelings related to their expectations of one another." The clinician then introduced a visual teaching framework as a supplement to this hypothesis testing called the social emotional chain reaction (SECR).[55]

Fig. 2 depicts the interplay among people's thoughts and feelings, actions, and reactions. The five steps within the SECR are constantly reoccurring as visualized by the movement of the five gears. The SECR was developed to simplify and organize a seminal social aspect that is taken for granted: People are all socially responsible to one another and all participate in the social milieu that they construct.[55] That is, based on the situation, there are expectations for actions, responses, and reactions. The words or actions (or non-actions) can be thought of as expected or unexpected behaviors for that specific situation. *This is not about right or wrong or appropriate or inappropriate.* The SECR is about how behaviors impact one another. For example, *yelling* is an action that can be thought of as both expected and unexpected based on the situation. Yelling is most definitely an expected behavior: when at sporting events, if in extreme pain, during playground play, to express

injustices, when getting help from someone far away, etc.

On the other hand, yelling is usually thought of as an unexpected behavior during teacher talk time in the classroom, during library silent reading time, when visiting a hospital, etc. Interestingly, yelling can also be both an expected and unexpected behavior, depending on how and why it occurred. An example might be when 12-year-old child yells, "stop that" in anger at their sibling because of a "pinch" while watching videos at home (expected behavior based on the situation) but if the yelling (from the pinch) occurs during the vows at a wedding ceremony, then yelling is an unexpected behavior for that situation. This example highlights an extremely important distinction that must be considered when using the terms *expected behavior* and *unexpected behavior*. Teaching that a single behavior is "unexpected" or simply saying, "yelling is unexpected!" without regard for the situation (place + person + what's happening) is incorrect teaching and neglects the social metacognitive importance of the social landscape and the chain reaction. It changes the activity into a way to shame or blame a student for their behavior. As we have cautioned in our previous works,[57] don't do it.

In Li's case, teaching about the SECR began with showing him the visual framework and describing how the chain reaction occurs. The clinician did this by drawing stick people with thought bubbles and labeling feelings (near the heart) while stating the social emotional chain reaction: What Person 1 does/says affects how Person 2 thinks/feels (can be positive or negative). This causes Person 2 to act/react based on their feelings, which ultimately has an impact on how Person 1 thinks/feels (could be positive or negative).

The clinician then wrote these primary hypotheses on the whiteboard: "People have thoughts/feelings related to their expectations of one another." Li struggled to make sense of how he might go about proving or disproving this hypothesis, so the clinician and Li jointly generated six sub-hypotheses with the overall notion that people notice other people's words or actions when sharing space. Li collected data on the six statements listed below through personal observation, interviewing peers, teachers, family members, and watching video clips online. Note:

The words in parenthesis below were not written on the whiteboard for Li to see but are included below as they represent core social competencies found on the ST-STM.

Each week, Li presented his findings based on his data collection. After several weeks, he concluded that statements (1–4) were true and statements (5) and (6) were still "under investigation." His perspective on the last two points was important because it changed the direction of the next several weeks. The fact that he was unsure about items (5–6) was revealing in that both statements related to how others might view *Li's* actions/reactions. Li did agree to modify statements (5) and (6) to include the term "loosely" and explained that he would have to consider whether the "other kids were blockheads" to decide. The clinician and Li jointly decided to shelve the last two items for a later date given Li's reticence to explore that his words and actions might have an impact on others thoughts and feelings.

Social Emotional Chain Reaction Hypotheses

1. There are expectations based on the people, place, and what's happening.
2. When I notice or observe others (social attention), I try to make sense of what they are saying and doing (social interpretation).
3. I can decide to respond or not (social problem solving).
4. I can learn to notice my own words, actions, and reactions (social self-awareness).
5. If I understand the social expectations and "loosely" adapt my words and actions so that others respond in a manner I hoped, then I should continue (social response).
6. If I understand the social expectations and "loosely" adapt my words or actions and it results in responses that I don't like, then I should reevaluate (social response).

Part 2: Group Lesson: Understanding How Groups Work: Hanging out with others involves being in a group. What do we already know about groups and how they work?

From a clinical perspective, one way to help students understand what they already know about the social world is to present questions to small groups to debate, argue, or discuss. In Li's social thinking group, the clinician generated 10 questions that mirrored the following components of the ST-SCM through:

- Exploring knowledge about groups via observation (social attention).
- Making sense of social observations and hidden expectations (social interpretation).
- Using clues to predict thoughts, feelings, beliefs, and possible outcomes based on actions/inactions in self and others (social self-awareness and problem solving).

The 10 questions were introduced to the group one at a time. Group member ideas and comments were then recorded on the whiteboard in real time. At the end of every lively discussion, students were asked to notice the whiteboard and reflect on the rich amount of knowledge they already knew about how the social world works. If/when one of the 10 questions stumped the group, an information gathering scavenger hunt for the unknown knowledge ensued led by Li as the chief scientist. The following comments are examples of how Li's group responded to questions (1) and (2). The remaining eight questions are listed below, but interventionists are encouraged to generate their own questions with their students/clients based on current understanding of how groups work in the social world.

- **What do you already know about how groups work?**

    Responses: "classrooms are groups," "kids hang out in groups," "people get in lines (a kind of group) to avoid chaos."

- What do teachers expect from students when they are speaking/teaching?

    Responses: "teachers usually talk during teaching time and kids don't talk unless they are asked to talk," "kids are supposed to at least look like they are listening."

Other discussion questions included:

- When you are in a group, what do you expect from other kids?
- Are there written group rules in classrooms or meetings? If so, what are they?
- What about unspoken group norms? How would we explore that?
- What happens if kids don't follow the group norms?
- How do kids get themselves into groups?
- What makes it easy (and hard) for you to work alone (in groups)?
- How would others know you are upset, angry, thrilled, nervous?
- What sorts of signs do you show, if any?
- How would you know this about others?
- What makes a "smart" versus "wacky" versus "silly" guess about how groups work?

    Once the group addressed all 10 questions, the group members agreed that hanging out with others involves being in a group and groups are complicated. However, they also realized they already had a foundation of social knowledge about group characteristics, unspoken group expectations, and how groups work in some social landscapes (e.g., classrooms, teaching time, break time).

    Part **3: Next Steps: More knowledge for Action:** *How do people actually get into groups to hang out? How do I get into a group?*

    Li's personal social goal of "sometimes hanging out with other kids" was the impetus for the introduction of a new visual teaching framework called the *4 Steps of Face-to-Face Communication*[58] (see Fig. 4). The purpose of this framework is to show how face-to-face communication is a multistep and constantly shifting process involving nonverbal body cues, perspective-taking, and language.

    Fig. 4 uses cartoon-like characters to depict the progression of (1) noticing others (thinking about others), to (2) moving one's body into a group (physical presence), to (3) observing others (thinking with our eyes), to (4) relating to others (using words).

    The clinician presented the following possible explanation and possible hypothesis to test
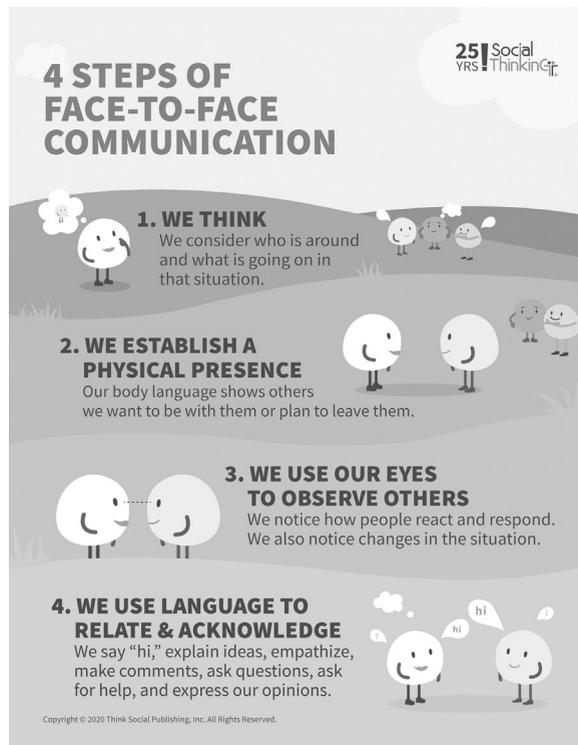
Figure 4 Four steps of face-to-face communication.

related to how people get into groups to hang out.

Step 1 **Think:** Social brains first must notice people. Sometimes there is a brief thought like, "Who's that kid?" or "I know them," or "He's in my class."

Step 2 **Establish physical presence**: People's bodies can signal to others that there is an intention to communicate. This is done by moving toward the person or group and then facing one's feet, hips, shoulders, and head in their direction. Most often, people stand about one arm's length away from one another, but different cultures have different norms about how close or how far away to stand each other. Turning one's body away from the group shows the intention of leaving.

Step 3 **Think with eyes**: People use their eyes to gather social clues. This is *not about using "eye contact."* In the STM, this phenomenon is called *Thinking with one's eyes*,[55] and it's a way to gather social data—like a social scientist. Thinking with eyes is also not about staring.

Instead, people use their eyes to notice what others are doing in the group (e.g., looking at their phones), how they are reacting to one another's words or actions (e.g., laughing, nodding, responding with words), or whether the group is staying together or pulling apart.

Step 4 **Words to relate to others:** Words are a way to connect experiences between members of a group and to share stories. Most often, one's words or ideas are loosely connected to what others are talking about, but this is *not the same as staying on topic.* Instead, people make comments that have a similar thread or idea related to others' stories or experiences.[59] Sometimes people ask questions, add their own new ideas, or just comment to show interest by saying words like, "oh" or "cool" or "whoa!"

Li used the visual teaching framework to guide his observations and test whether this four-step hypothesis about group communication was accurate. He polled his group mates and adults and conducted a series of

observations. His conclusions were that people do go through a variation of these steps as they move in and out of groups. He also noticed and reported that the steps "happen really fast" and that his peers (preteens) do other things in groups like bump into each other, hug one another, and grab each other's phones, yet "no one seems to mind." While confused by these actions, he was also intrigued and expressed a desire to learn more about how kids know who and when to hug, when to touch someone else's phone, and why some kids bump or lean into each other. These questions prompted the next series of hypotheses to explore.