ARTIGO

DOI: 10.20396/etd.v22i1.8655487

THE ROLE OF THEORY OF MIND AND LEARNING OF CHILDREN WITH AUTISM SPECTRUM DISORDERS IN CLASSROOM SETTINGS

O PAPEL DA TEORIA DA MENTE E DA APRENDIZAGEM DE CRIANÇAS COM TRANSTORNO DO ESPECTRO AUTISTA NA SALA DE AULA

EL PAPEL DE LA TEORÍA DE LA MENTE Y EL APRENDIZAJE DE LOS NIÑOS CON TRASTORNOS DEL ESPECTRO AUTISTA EN SALA DE CLASE

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ABSTRACT

Developing social competence is inherently difficult for learners with autism spectrum disorder (ASD). These challenges related to social competence are often attributed to social cognition including Theory of Mind (ToM) and not only interfere with the ability to attain and maintain social relationships but can also hinder academic performance. Educators are responsible and accountable for improving the academic performance of children with ASD and because of this emphasis on academic instruction, interventions that address social cognition including ToM may be overlooked in classroom settings. Yet, the influence of ToM and social cognition on both social and academic performance makes it essential that educators begin to address these skills early and in classroom settings. The purpose of this paper is to review the ToM construct as well as the links between ToM and the academic skill development of learners with ASD. This article includes examples of evidence-based educational strategies (i.e., reading and mathematics) for students with ASD and explain how these strategies may also support ToM.

KEYWORDS: Autism. Theory of Mind. Reading. Mathematic.

RESUMO

O desenvolvimento da competência social é intrinsecamente difícil para os alunos com transtorno do espectro do autismo (TEA). Esses desafios relacionados à competência social são frequentemente atribuídos à cognição social, incluindo a Teoria da Mente (ToM), e não apenas interferem na capacidade de alcançar e manter relacionamentos sociais, mas também podem prejudicar o desempenho acadêmico. Os educadores são responsáveis pela melhora do desempenho acadêmico das crianças com ASD e, devido a essa ênfase na instrução acadêmica, as intervenções que abordam a cognição social, incluindo ToM, podem ser negligenciadas em ambientes de sala de aula. No entanto, a influência do ToM e da cognição social no desempenho social e acadêmic o torna essencial que os educadores comecem a abordar essas habilidades precocemente e em ambientes de sala de aula. O objetivo deste artigo é revisar a construção do ToM, bem como os links entre o ToM e o desenvolvimento de habilidades acadêmicas de alunos com ASD. Este artigo inclui exemplos de estratégias educacionais baseadas em evidências (ou seja, leitura e matemática) para alunos com TEA e explicam como essas estratégias também podem apoiar ToM.

PALAVRAS-CHAVE: Autismo. Teoria da Mente. Leitura. Matemática.

RESUMEN

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Submetido em: 28/05/2019 - **Aceito em:** 20/01/2020

ARTIGO
DOI: 10.20396/etd.v22i1.8655487

El desarrollo de la competencia social es intrínsecamente difícil para los estudiantes con trastorno del espectro autista (TEA). Estos desafíos relacionados con la competencia social a menudo se atribuyen a la cognición social, incluida la Teoría de la mente (ToM) y no solo interfieren con la capacidad de alcanzar y mantener relaciones sociales, sino que también pueden obstaculizar el rendimiento académico. Los educadores son responsables y responsables de mejorar el rendimiento académico de los niños con TEA y, debido a este énfasis en la instrucción académica, las intervenciones que abordan la cognición social, incluida la ToM, pueden pasarse por alto en el aula. Sin embargo, la influencia de ToM y la cognición social en el rendimiento social y académico hace que sea esencial que los educadores comiencen a abordar estas habilidades desde el principio y en el aula. El propósito de este documento es revisar la construcción de ToM, así como los vínculos entre ToM y el desarrollo de habilidades académicas de los alumnos con TEA. Este artículo incluye ejemplos de estrategias educativas basadas en la evidencia (es decir, lectura y matemáticas) para estudiantes con TEA y explica cómo estas estrategias también pueden ser compatibles con ToM.

PALAVRAS-CLAVE: Autismo. Teoria de la Mente. Lectura. Matematicas.

Vince is a first grader with autism spectrum disorder (ASD). He is reading Author Goes to Camp by Marc Brown in a cooperative group with two typically developing peers. His group is tasked with generating questions and responding to peer questions about the story. In this story, Rocky is the camp counselor at the boy's summer camp, and the group previously read that the boys' will be competing against the girls' summer camp. Vince reads that Rocky yelled at the boys about their physical shape: "Stand up straight! Suck in those guts! I've never seen such a soft, flabby bunch. No dessert for you men this summer!" After Vince finished reading the page, a peer asked, "Why is Rocky being so mean to the boys?" Vince looked at the book and did not respond. After his friend repeated the question, Vince replied, "I don't know."

Theory of Mind (ToM) is an individual's ability to recognize and infer the mental states of self and others to explain and predict behavior (BEEGER et al., 2015). ToM understanding is reciprocal as individuals attribute mental states as both the cause and effect of actions and behaviors including how their own behavior impacts another's mental state and subsequent actions and vice-versa (HUTCHINS et al., 2016). This ability to interpret the thoughts, beliefs and desires that motivate behaviors and actions is central to understanding others in our daily lives (TOMPKINS; FARRAR; MONTGOMERY, 2019). In the opening vignette, to answer *"Why is Rocky being so mean to the boys?"* Vince must interpret Rocky's yelling as mean and infer that Rocky's behavior is caused by his desire to win and irritation and/or worry that the boy's camp will lose the competition. In other words, Vince has to understand and apply ToM.

ToM is described as cognitive and affective. That is, ToM can be characterized by the ability to interpret (i.e., cognitive) and respond effectively (i.e., affective) to the thoughts, beliefs, motivations, understanding and the emotional responses of self and others (WESTBY; ROBINSON, 2014). ToM is also interpersonal and intrapersonal (WESTBY; ROBINSON, 2014) as learners understand and respond to one's own thoughts and mental states (i.e., intrapersonal) as well as those of others (interpersonal). Consider the opening vignette, one could ask Vince how he might feel in the described situation or if someone yelled at him. The

DOI: 10.20396/etd.v22i1.8655487

cooperative group could compare and contrast Rocky and the boys' feelings and discuss why they differ. The group might predict how the characters respond to Rocky's emotional state or offer another strategy for Rocky to use to motivate the boys camp to get ready for the competition. The group may also ask how the characters will feel if they win or lose the competition or share their own examples of participating in competitions and how it felt to win or lose. Such questioning, reasoning and sharing requires learners to engage in cognitive, affective and inter- and intra- personal ToM.

ToM develops over time, and has evolved into an expansive, complex concept (WELLMAN, 2017). In the early years, ToM is evident when children think about what others are thinking or feeling (4-5 years) and progresses to thinking about how someone else perceives how another person thinks or feels (7 years). As children get older, their ToM becomes increasingly sophisticated as they understand more complicated actions or behaviors including lies, sarcasm, figurative language, etc. (8-12 years; WESTBY; ROBINSON, 2014). As ToM continues to develop, learners begin to understand when and how to apply reasoning and inferencing to make sense of new information or behavior (HUTCHINS et al., 2016), which involves metacognition or the ability to monitor understanding and employ strategies to support learning (e.g., self-questioning; WELLMAN; LAGATTUTA, 2004). Students with advanced ToM adjust their own beliefs and opinions based on the integration of new knowledge and prior knowledge/experiences (IM-BOLTER; AGOSTINO: OWENS-JAFFRAY, 2016). These cognitive skills associated with ToM have implications for school success as ToM is predictive of academic skill development (SOUTHALL; CAMPBELL, 2015) including learning to read and mathematics (KIM et al., 2018; WELLMAN, 2017).

1 TOM AND LEARNERS WITH ASD

ASD is one of the fastest growing disability categories. Prevalence figures in the United States suggest that 1 in 59 children have an ASD (Centers for Disease Control and Prevention [CDC], 2018). Individuals with an ASD diagnosis share two core characteristics, (1) social communication deficits, and (2) restrictive and/or repetitive behaviors/interests. The presentation and severity of these characteristics differs from child to child but are present for all individuals with ASD. Foundational to ASD is an underlying difficulty with social communication that manifests by age two (IBANEZ; STONE; COONROD, 2014).

The challenges learners with ASD experience related to social communication include the pairing of social cognitive skills (e.g., ToM, social engagement, perspective taking, self-monitoring, problem solving) with the application of specific, discrete social skills (e.g., initiating, responding, maintaining interactions; BELLINI; GARDNER; MARKOFF, 2014). Although ToM is not sufficient for the development of social skills, it is essential to social cognition or understanding (SOUTHALL; CAMPBELL, 2015) and predictive of a number of

DOI: 10.20396/etd.v22i1.8655487

complex social behaviors including developing and maintaining friendships, the ability to lie and deceive, and advocating and convincing others through effective argumentation (WELLMAN, 2017).

A difficulty developing ToM is considered a core challenge for learners with ASD (SEIDMAN; YIRMIYA, 2018). Learners with ASD inherently have difficulty understanding the mental states of self and others and applying this understanding to predict behavior, which impedes their communication and social development (HUTCHINS et al., 2016; SEIDMAN; YIRMIYA, 2018). These difficulties are more pronounced for learners with ASD than individuals with intellectual or other developmental disabilities (BARON-COHEN; LESLIE; FRITH, 1985; SOUTHALL; CAMPBELL, 2015), and require targeted, direct instruction (WELLMAN; LAGATTUTA, 2004). Because autism is a spectrum disorder, it is not surprising that there is also heterogeneity in performance on various ToM tasks as some learners with ASD struggle with ToM broadly while others are able to complete ToM tasks but fail to apply ToM in real world contexts (HUTCHINS et al., 2016). Like their typically developing peers, how learners with ASD perform on ToM tasks is linked to language development (e.g., SHIELD; PYERS; MARTIN; TAGER-FLUSBERG, 2016) including discourse (e.g., HALE; TAGER-FLUSBERT, 2005), use of mental state terms (e.g., wonder, believe; Tager-Flusberg, 1992), and receptive vocabulary (e.g., HAPPE' 1995). ToM is also associated with the level of autism symptom severity (e.g., JONES et al., 2018).

2 THE ROLE OF TOM AND ACADEMIC INSTRUCTION

The rising rates of learners identified with ASD, is also reflected in the number of students receiving services under the category of autism, which is growing more than any other disability category (US DEPARTMENT OF EDUCATION NATIONAL CENTER FOR EDUCATION STATISTICS, 2017).

As a result, general and special education teachers must address the core challenges associated with ASD including social competence while also teaching academic content. For teachers, these different goals may appear to be competing priorities; yet, social competence is highly predictive of academic functioning (e.g., MONTROY, 2014) and participation in and learning from academic instruction is socially demanding as it requires generating questions and providing reasoned explanations (WELLMAN; LAGATTUTA, 2004). Unfortunately, social competence is often neglected in academic settings (BELLINI et al., 2014).

In US schools, teachers are accountable for ensuring all students make adequate progress toward an increasingly rigorous set of curricular standards that promote student success in college and career (EVERY STUDENT SUCCEEDS ACT [ESSA], 2015). Only children with the most significant cognitive disabilities (one percent of the school population) receive

DOI: 10.20396/etd.v22i1.8655487

instruction targeting an alternate set of standards (ESSA, 2015), and the number of children with ASD who also have a diagnosis of intellectual disabilities (ID) is declining (31%; CDC, 2018). The changing prevalence figures ensure that both general and special education teachers are increasingly responsible for the education of learners with ASD as many (approximately 40%) of students with ASD are educated in general education settings at least 80% of their school day and more than half (58%) spend 40% or more of their day in these settings (US DEPARTMENT OF EDUCATION NATIONAL CENTER FOR EDUCATION STATISTICS, 2017).

The Common Core State Standards (CCSS) were developed to prepare students for post-school success (NATIONAL GOVERNOR'S ASSOCIATION, 2010). Forty-one US states have adopted the CCSS (2010), which emphasize critical thinking, problem solving and analytical skills. Teachers are expected to use these standards or standards of similar rigor adopted by their state to develop curriculum and monitor progress. In order to prepare students for the demands of college and career, these standards are intentionally complex, requiring the integration of content knowledge and a number of developmental skills (e.g., social, language). For example, related to reading, learners have to explain the author's point of view (CCSS.RL.6.6), compare and contrast the characters and their experiences (CCSS.RL.1.9), and in the area of mathematics, they must interpret the perspectives and reasoning of others, and form viable arguments (CCSS.MP3). These tasks are cognitive and affective because they involve the ability to recognize (cognitive) our own and others mental states (intra- and inter-personal) in applied contexts (affective). These standards require the ability to understand the thinking of others, apply that understanding to generate new knowledge, monitor one's understanding, and effectively use communication skills and strategies to share that knowledge and respond to others comments and interpretations. In other words, learners apply knowledge of ToM and discrete social skills to engage and learn.

3 READING DEVELOPMENT AND LEARNERS WITH ASD

The reading abilities among children with ASD are highly variable and linked to language (SEE WHALON, 2018); yet, a number of children with ASD develop effective decoding skills, but struggle with comprehension (e.g., JONES et al., 2009; MCINTYRE et al. 2017; RICKETTS et al., 2013). Reading comprehension is complex and involves the integration of several cognitive and linguistic skills that together contribute to the reader's development of a coherent mental representation of text (KIM, 2017). This process involves the reader applying knowledge of vocabulary and grammar along with higher order processing tasks necessary to integrate information from the text including accessing prior knowledge, generating inferences, and monitoring understanding (KIM, 2017).

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An inability to use knowledge of social understanding to make inferences further compromises comprehension (CARTWRIGHT, 2015). For example, comprehending text requires the reader to infer information about mental states, emotions and motivations of characters and the author (DORE, et al., 2018), and there is growing evidence of a link between the development of ToM tasks (e.g., interpreting mental states, character intentions, perspective taking) and comprehension of typically developing learners (e.g., ATKINSON, SLADE, POWELL, LEVY, 2017; GUAJARDO; CARTWRIGHT, 2016; KIM, 2017) as well as learners with ASD (MCINTYRE et al., 2017; RICKETTS et al., 2013; MCINTYRE et al., 2018). The association between ToM or perspective taking and comprehension suggests that for learners with ASD, comprehension interventions may require a focus on social cognition (MCINTYRE et al., 2018) including the ability to make social inferences during reading. Moreover, recent research with typically developing learners indicates the links between reading comprehension, vocabulary knowledge and social skills may be reciprocal (SPARAPANI et al., 2018).

For example, the CCSS (2010) in reading embed the expectation of deep comprehension including understanding and applying academic vocabulary knowledge, the ability to take the perspectives of others and engage in complex reasoning (LARUSSO et al., 2018). Even early CCSS in reading include a focus on perspective taking, which requires ToM as learners are expected to compare and contrast character experiences in stories. By second grade, this expectation progresses to include causal connections between events and subsequent character perspectives or point of view (NATIONAL GOVERNOR'S ASSOCIATION, 2010). This focus on explaining point of view initially involves simpler text with fewer perspectives and events (CARTWRIGHT, 2015) and becomes increasingly complex as learners consider multiple sources of information, varying accounts, and differing points of view in fiction and nonfiction texts (NATIONAL GOVERNOR'S ASSOCIATION, 2010). In upper grades, learners are expected to understand changing and multiple perspectives, gather evidence from text to support a prediction or hypothesis, infer vocabulary from text, integrate information from multiple sources, assess the quality of an argument, and critique the arguments of others (NATIONAL GOVERNOR'S ASSOCIATION, 2010). The complexity of these tasks relies on comprehension monitoring and effective reasoning (SNOW, 2018). Therefore, interventions addressing comprehension will need to support language development, social inferencing, and executive functioning skills necessary to interpret and integrate multiple perspectives and reframe interpretations based on new information (DORE et al., 2018).

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4 MATHEMATICS DEVELOPMENT AND LEARNERS WITH ASD

Students with ASD have an uneven mathematical profile with variable performance (OSWALD et al., 2016; SCHAEFER; WHITBY; MANCIL, 2009). Students with ASD are more likely to display characteristics of a mathematical disability than they are to exhibit mathematical giftedness (MAYES; CALHOUSN, 2009; OSWALD et al., 2016), with relative strengths in calculation compared to problem solving (JONES et al., 2009; SCHAEFER et al., 2009). Rote memorization skills and understanding of procedures may help students with ASD perform similarly to their typically developing peers in early grade mathematics, however, an achievement gap begins to appear as the students enter late elementary school and continues to widen in later grades. This gap may be related to the progression of mathematical concepts from more concrete skills expected in early elementary to more abstract/complex in later grades (OSWALD et al, 2016; WEI; CHRISTIANO; YU; WAGNER; SPIKER, 2014). For example, in first grade, students are asked to "organize, represent, and interpret data" and then answer questions about the number of data points. By fifth grade, however, students are expected to not only make and interpret graphs, but also to "use conversions in solving multi-step, real world problems" (NATIONAL GOVERNOR'S ASSOCIATION, 2010). Students need advanced ToM skills of making judgements and metacognitive strategies (WESTBY; ROBINSON, 2014) to engage in these rigorous mathematics standards.

Beyond rigorous content standards, the CCSS outline mathematical practice standards, which designate the ways students should engage in mathematics to promote a deep understanding. As a part of these mathematical practice standards, students are expected to have opportunities to participate in mathematical problem solving where students share their problem solving strategies and solutions, and engage in discussions about the reasonableness of these arguments (NATIONAL GOVERNOR'S ASSOCIATION, 2010). However, the ability to actively engage in these discussions requires both cognitive (e.g., cognitive flexibility, rules for conversational interactions) and affective (e.g., reflection of one's knowledge, regulation of behavior, figurative language, turn taking) ToM skills (WESTBY; ROBINSON, 2014) that may be particularly difficult for students with ASD. Therefore, students with ASD will benefit from instructional strategies that support their ability to explain their mathematical reasoning and successfully participate in mathematical discourse (i.e., argumentation) required by CCSS.

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5 SUPPORTING TOM IN READING AND MATHEMATICS INSTRUCTION

Many reviews on the effects of ToM interventions for learners with ASD indicate that although ToM can be taught, these skills rarely generalize to real world social situations (e.g., FLETCHER-WATSON et al., 2014; PAYNTER; KEEN; ROSE, 2016; SOUTHALL; CAMPBELL, 2015) indicating interventions that solely target ToM may have little educational utility. Yet, there are several skills that children with ASD are expected to engage in to learn that require application of ToM in instructional contexts. With mixed findings on the impact of direct ToM instruction on the ability of children and youth with ASD to apply that knowledge in context, learners with ASD are likely to need supports to understand academic content that emphasizes ToM (e.g., figurative language, character motivations, cognitive flexibility) as well as participate in the instruction that requires skills associated with ToM (e.g., argumentation, perspective taking). Moreover, to demonstrate depth of knowledge in reading and mathematics, students with ASD will also need to effectively reason through complex content and explain their thinking/ perspectives as well as evaluate the explanations/reasoning of others.

Westby and Robinson (2014) noted that there are several evidence-based strategies that can be applied to promote the cognitive, social, and language skills foundational to ToM. ToM instruction for learners with ASD should not only address the ability to understand ToM, but also how to apply that knowledge in daily life. While there are no empirical studies that directly measure the effects of evidence-based academic instruction on ToM development, there are effective educational strategies that when adapted for learners with ASD have improved reading comprehension (e.g., CHIANG; LIN, 2007; EL ZEIN; SOLIS; VAUGHN; MCCULLEY, 2014; FINNEGAN; MAZIN, 2016; SENOKOSSOFF, 2016; WHALON; AL OTAIBA; DELANO, 2009) and mathematical problem solving (e.g., ROOT; HENNING; COX, under review). For example, visual supports enhance the learning of children and youth with ASD by making abstract content more concrete (WONG et al., 2013). Visual supports can take a variety of forms, including maps, labels, pictures, or graphic organizers. In the next section, we will describe how visuals have been applied in the reading and mathematics instruction of learners with ASD and how they may support ToM.

Graphic Organizers. Graphic organizers are one type of a visual shown to support the academic learning of individuals with ASD (e.g., ALRESHEED; MACHALICEK; SANFORD; BANO, 2018; KNIGHT; SARTINI, 2015; WONG et al., 2013), and they have been successfully used to enhance text comprehension (e.g., EL ZEIN et al., 2014; FINNEGAN; MAZIN, 2016; SENOKOSSOFF, 2016; WHALON et al., 2009). Graphic organizers provide a visual representation illustrating the relationship between concepts to support comprehension when these concepts appear in text (ELLEMAN; COMPTON, 2017). They can be applied before, during, and after reading to help learners organize information, identify what is most

DOI: 10.20396/etd.v22i1.8655487

important and integrate details to create a broad understanding of text (SENOKOSSOFF, 2016). Additionally, they assist the learner in making connections between text and background knowledge (FINNEGAN; MAZIN, 2016) improving inference making (ELLMAN; OSLUND, 2019). There are several varieties of graphic organizers that can be selected based on the type of text and individual need (FINNEGAN; MAZIN, 2016).

For example, to build understanding of narrative text structure, story maps help students organize, recognize and remember the important elements of a story (e.g., characters, setting, events, problem and solution). Because nonfiction text is written for a variety of purposes, graphic organizers are designed to examine different organizational structures including cause and effect or sequencing of events (HOGAN et al. 2011). For children with ASD, studies have applied graphic organizers to support comprehension of narrative text using story or character maps (BETHUNE; WOOD, 2013; DODD; OCAMPO; KENNEDY, 2011; STRINGFIELD; LUSCRE; GAST, 2011; WILLIAMSON; CARNAHAN; BIRRI; SWOBODS, 2015), and nonfiction text with graphic organizers that support sequencing (MIMS; HUDSON; BROWDER, 2012) or comparing and contrasting information (CARNAHAN; WILLIAMSON, 2013). These interventions apply systematic instructional procedures (e.g., least to most prompting hierarchy) to correctly complete the graphic organizer (BETHUNE; WOOD, 2013; MIMS et al., 2012; STRINGFIELD et al., 2011), or paired adult scaffolding with corrective feedback (CARNAHAN; WILLIAMSON, 2013; WILLIAMSON, et al., 2015). After participating in these studies, learners with ASD have improved their correct responding to comprehension questions.

Engaging with narrative text provides several opportunities to discuss character mental states (e.g., thinking, knowing, feeling; MILLER, 2006) as well as multiple, conflicting perspectives and changing points of view (HODGES et al., 2018; MORI; CIGALA, 2016). To promote a thorough understanding of a story, Shanahan and Shanahan (1997) suggested story maps not only teach narrative structure, but also emphasize varying and changing character perspectives often found in narrative texts. These opportunities to engage in perspective taking may not only improve comprehension of text, but also promote ToM (TOMPKINS et al., 2019). For example, fourth and fifth graders with ASD improved their ability to retell from the perspective of different characters after completing a story map that embedded opportunities to describe character traits and infer character feelings/perspectives at different points in the story (DODD et al., 2011). In another study, Williamson and colleagues taught 3 adolescents (ages 16-17) to complete character event maps based on chapters from the Hunger Games. To complete the map, participants with ASD identified and described the events important to the characters, and explained what made these events important. In addition, participants identified and reviewed the meaning of figurative language from the chapter, and made predictions for the next chapter. Modeling

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and feedback were faded as participants increased their ability to respond to fact and inference questions (WILLIAMSON et al.).

McTigue and colleagues (2015) suggested adding thought bubbles to character maps that illustrate what a character is thinking or feeling along with evidence to support claims. Thought bubbles are a way to help children visualize different perspectives as they depict an image of what someone is thinking (e.g., FISHER; HAPPE, 2005; KERR; DURKIN 2004; PAYNTER; PETERSON, 2013; WELLMAN et al., 2002). Perspectives represented in thought bubbles typically progress from simpler ToM concepts such as false beliefs to more advanced concepts, but their application in classroom contexts is still unknown (PAYNTER; PETERSON, 2013).

Schema-based Instruction. Visual supports in mathematics instruction are particularly useful, as mathematics requires students to understand and utilize symbols, visual representations, graphs, and diagrams (AJAYI; LAWANI, 2015). One form of visual support used to promote mathematical reasoning and engage in mathematics problem solving is known as schema based instruction ([SBI] PELTIER; VANNEST, 2017). SBI helps students categorize mathematical word problems by structure (e.g., group, change, ratio), map the quantities onto a corresponding diagram (i.e., schema), use a problem solving strategy related to that problem type, and then check their work is reasonable. Traditional SBI includes explicit instruction on the problem solving process, teacher think alouds, and visually mapping the quantitative relationship onto a schematic diagram. While SBI is an effective strategy for students with mathematical difficulties (JITENDRA et al., 2015), some students may need additional supports to successfully engage in this problem solving process. Students with ASD often display strengths in routine (BARON-COHEN, 2002) and visual reasoning (MAYES; CALHOUN, 2008), with deficits in their ability to use metacognition to self-monitor their progress (BROSNAN et al., 2016) and effectively communicate their reasoning. Therefore, researchers have provided additional supports to traditional SBI specifically designed to capitalize on their strengths in routine structures (e.g., task analysis, visual heuristic) to support their ability to monitor their own progress and thinking.

With these added evidence-based supports for students with ASD, modified SBI has been shown to help students with ASD engage in the problem solving process while explaining their mathematical reasoning (COX; ROOT, 2018; ROOT; HENNING; COX under review). By mapping the abstract mathematical relationships onto a visual diagram, and providing a visual step-by-step problem solving structure for students with ASD, modified SBI simultaneously supports the advancement of content knowledge and ToM development for students with ASD as it helps students think about their own thinking and then communicate those thoughts.

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6 CONCLUSION

Instruction specifically targeting ToM may teach learners with ASD to solve ToM tasks, but these skills seldom transfer to real world contexts (e.g., FLETCHER-WATSON et al., 2014; PAYNTER, et al., 2016; SOUTHALL; CAMPBELL, 2015). Research demonstrates a link between ToM and academic learning and many CCSS require ToM understanding and the application of skills associated with ToM (e.g., perspective taking, argumentation). With the emphasis on depth of knowledge prevalent in the CCSS, educators of students with ASD will need strategies to support active engagement and learning of children with ASD as they apply skills influenced by ToM to learn and demonstrate their knowledge. As Westby and Robinson (2014) acknowledged, there are several evidence-based practices that enhance the underlying skills associated with ToM. Specifically, for learners with ASD, the National Clearinghouse on Autism Evidence and Practice (NCAEP) provides descriptions and evidentiary support for strategies shown effective in improving the language and learning of individuals with ASD. In this paper, we highlighted the use of visual supports, but there are several other evidence-based strategies designed to promote the language, executive functioning, and social skills necessary to support the ToM of learners with ASD in academic contexts. In the future, more research is needed to determine whether or not the use of these strategies not only scaffolds but also builds ToM as learners with ASD gain more experience applying skills dependent on ToM with support.

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