Mindreading in the Classroom

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The Mental and Social Lives of Children and Adolescents in School

By

Sandra Leanne Bosacki

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This book is dedicated to all my past and current students who keep me questioning what I think I know.

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PREFACE

The seed of this book was planted in my brain as early as I can remember—possibly to when I was around 3 or 4 years of age, and I found myself fascinated with people's faces—forever wondering about what messages laid in their eyes and mouths and overall facial expressions. And I was especially mystified when the person's eyes did not match their mouth or their voice, such as when their eyes seemed sad or angry, but they were laughing. What were they thinking and feeling—as my language skills were still developing—the meaning of their messages was either in their face, voice, or the way they moved their body and arms/hands.

My persistent questioning and curiousity of the world around me provided the foundation for my research questions to this day and my childhood fascination about other how people's minds and emotions connect with their actions guides this book. What are people thinking and feeling and how does this shape their behaviors? What type of clues do their faces and bodies provide to help us figure out our social world?

My questions increased once I started school and tried to figure out my teacher and my classmates, as an only child I had little exposure to other children until I was 5 when I started Kindergarten. Before the arrival of my sister—as an only child for almost 5 years—I always enjoyed my time alone, where I could spend quiet time with my mind and explore the world on my own with my imaginary friends. I enjoyed the freedom to explore and wonder, away from constraints of adult rules and time.

My main areas of puzzlement focused on questions such as what did my teachers' and classmates' faces say about their thoughts, feelings, and intentions? Was my teacher happy or angry with me? Did the girl I sat beside at lunch want to be with me or not? How did I know if that group of children on the playground wanted me to join them or not?

My memories as a young child in early primary school was that I often spent my time in the classroom and playground either observing my teacher trying to figure out what they wanted, or other watching children from a distance, where I often kept a calculated safe distance from others, and remained just outside of the play circle or group, playing quietly alone to avoid being noticed by others. This preference to be in the social background often concerned my early grade teachers, as well as my parents to the extent that they planned for another child. Thus, my sister was born

almost 5 years after my birth which ended my term of being a singleton. My preference for solitude did not waiver, as once I was labelled the 'big sister', I now needed to be even more clever and creative than before to create my alone time. Once my sister arrived, it became important for me to carve out times where I could be alone with my thoughts and feelings, and work on expanding my private world.

As I progressed through later elementary school, during my times of solitude, I often found solace and peace in writing and reading, and began a life-long habit of diary and memoir-keeping. As I approached adolescence and found the transition to the years of double digits emotionally challenging I often felt silenced, and my desire to express my thoughts in writing increased. Within secondary school, it appeared to me that people's social behaviors became even more mysterious and ambiguous. To help solve these social mysteries, I was constantly curious and always questioning the actions of others, wondering, but never quite sure, about what motivated them to act in peculiar ways—what were they thinking and feeling? Such questions as: why did that group of girls ignore me? Or why did the teacher not smile at me this morning when I smiled at her—did I do or say something to upset them? This constant questioning of other's motivations and behaviors remained in my mind throughout adolescence into adulthood.

Such questions and experiences during my youth drive my lifelong passion of working with youth, to learn more about their minds and who they are as young people, and how their thoughts and emotions guide their interactions through their school life.

I remain forever curious about how a child's ability to read the minds of others influences how they feel about themselves, and how they view the world around them. Most importantly for this book—how did this ability to read other's minds influence their ability to learn in the classroom and get along with their teacher and peers?

This book continues my academic journey over the past 30 years as I continue to explore adolescent's social cognition and communication patterns with others and themselves. Despite the decades of research on young peoples' abilities to read the minds and emotions of others, many dimensions of the mental landscape of youth remain a mystery. This unexplored mental landscape of youth motivates me to learn more about how these life functioning skills help youth to navigate their school life, and drives me to continue to ask questions about the development of a young person's mind within learning contexts.

As researcher in the applied developmental sciences, I wonder how the ability to understand and recognize the emotions and perspectives in others

affects our learning experiences in school and home. Most importantly, how can we help those youth who struggle with life's challenges in school to gain emotional health? How can we encourage the development of the life skill of mindreading and a kind mental mindset within the classroom? I encourage you to join me on my quest to figure out why some youth choose to use their mindreading skills to either help or harm others and themselves, and how this shapes their time in school. After reading this book, I hope that my words encourage you to consider and question the importance of mindreading in the classroom. In sum, I hope that this book will inspire you to further explore what drives a young person to feel the need to try to 'figure people out,' and how this motivation and skill to learn about other's minds shapes their lives in school and into adulthood.

S. Bosacki, Hamilton, Ontario, September 10, 2024.

PART I:
FOUNDATIONS

"For I am a Bear of Very Little Brain, and long words Bother me."
—*Winnie-the-Pooh said to The Owl,* p. 50, A. A., Milne, 1926.

In this section, the three chapters will focus on the basic definitions and key theories and controversies regarding the research area and concept of "Theory of Mind", or the ability to make inferences regarding other individuals' mental states such as perspectives, intentions, feelings, and beliefs. The term 'Theory of Mind' is part of a larger conceptual umbrella used to capture multifaceted sets of social-cognitive abilities that allows one to 'read' others' mental states within the context of social action. Such mentalization skills enable us to recognize, grasp, and reason about multiple perspectives and emotions, understand social ambiguity, and make sense of social transgressions. Competencies in such skills help humans to engage with each other, make social decisions, and communicate effectively. Throughout this book I will explore young people's ability to understand or make meaning of human thoughts and feelings, and how such 'psychological understanding' relates to their sense of self and identity, peer relations, and socio-communicative competence and emotional well-being within the school setting.

Chapter 1 will provide an overview of the key questions and brief guide to help the reader to navigate the book's contents. Chapter 2 will focus on early seminal theories and methods associated with Theory of Mind research and discuss current debates and controversies concerning Theory of Mind and teaching and learning. Chapter 3 will provide a brief introduction to the relatively new and emerging transdisciplinary field of developmental social neuroscience within the context of education. Overall, these initial chapters will provide an overview of early influential developmental theories and models, and key foundational research studies will serve as a guiding light for current work on mentalization and learning within the school context.

CHAPTER 1

INTRODUCTION

To ask the hard question is simple,
The simple act of the confused will.
—W.H. Auden (1929). *The Question* cited in J. Wain (Ed.), *The Oxford Anthology of English Poetry: Blake to Heaney* (1990; pp. 684-5). New York: Oxford University Press.

1.1. Introduction

This chapter will present an overview of the key issues in research on Theory of Mind (ToM). A brief introduction will include significant points that outline ToM foundational theories, research, and practical implications. This chapter will also include key questions that will guide the reader throughout the book, and provide over-arching, or meta-themes that will serve as connective conceptual threads that will run throughout all book chapters. The chapter ends with an overview of the book structure.

Overview

How can adult leaders help young people grow emotionally and socially during the transition from later childhood to adolescence? How can teachers and family members encourage them to develop adaptive skills that will help them navigate their identity and relationships through the tumultuous transition from childhood to adolescence? What are the key issues and implications for education and mental health? And how can teachers and researchers apply findings from developmental cognitive neuroscience research in the classroom and develop innovative strategies to improve the mental and social lives of youth? Why must we ask such questions and why are they important? This book will aim to address the above questions as well as to provide a valuable resource for parents, teachers, and students. Such resources may help young people to learn effective strategies to help navigate the social and mental world of the classroom.

Past research in developmental social neuroscience shows that development is shaped by brain-based individual differences in sensitivity to the social and emotional environment. This social environment is created through the intercommunications between the child and their parents/caregivers and in later years with their peers. The newly emerging field of applied developmental social cognition bridges the gap between recent social neuroscience research and educational practice. Also, despite the growth in research on the importance of relationships in developmental social cognition and emotion regulation, research in mentalization and learning across development continues to focus largely on cognitive aspects. Challenging this prevailing view in social cognitive science and education, this book discusses theory, research, and practice on *Theory of Mind or the ability to 'read' others' mental states within the context of social action.* This investigation of the mentalization processes involved in mindreading may contribute to the broader issues of social, moral, and emotional health, as well as hedonic or emotional well-being (pleasure-pain distinction, general affect) and eudaimonic or cognitive well-being (autonomy, personal growth, meaningfulness), and also relationships within diverse learning contexts.

This book also describes how teachers of all educational levels (primary, secondary, higher education), can draw on the concept of Theory of Mind to help youth learn to understand multiple perspectives, and thus communicate effectively. Finally, I will investigate how teachers can help young people to sharpen their *mind sense or mindreading skills*, and to make meaning of human thoughts and feelings within the school setting.

Drawing on examples from recent education and developmental social neuroscience research findings from longitudinal studies on collaborative learning and young people's growth in social cognition, the book will integrate research on teaching and learning with research on Theory of Mind. In particular, it will focus on the ambiguities and challenges that young people experience as they navigate the transitions throughout the levels of education. The book will build on, and move beyond, traditional cognitive and neurodevelopmental representations of how children and adolescents learn. Specifically, the book will provide a critical analysis of cutting-edge empirical evidence from social neuroscience and education studies, followed by a translation of the research findings into practical suggestions for progressive education. Overall, the book aims to foster the growth of new ideas in *developmental social neuroscience and education,* and to encourage innovative strategies that will help young people develop healthy minds and relationships in the classroom, community, and beyond.

Why is Theory of Mind found in the classroom? What should we look for, and where?

Research shows that the ability to 'read others' minds' or make sense of the signs and symbols evident in human communication is necessary for communication, collaborative learning, and relationship formation during childhood and adolescence. A growing area of social neuroscience and educational research shows that teachers, family members, and peers can serve as important contributors to how young people learn to make sense of the mental world. This book will investigate which aspects of these experiences foster brain growth and social cognitive abilities within a teaching and learning context.

That is, this book will explore how teachers and adults can help teach young people to understand mind, emotion, and spirit, and use this ability to help them navigate their relationships with teachers, family members, and peers. Throughout the chapters, I will aim to bridge the gap between theory and practice within the fields of human development, well-being, and education through discussion of the literature from the dual perspective of a researcher and a practitioner.

This will be the first book on state-of-the-art research from two separate fields—applied or educational social neuroscience and Theory of Mind. This book seeks to integrate theory and research with educational practice by encouraging educators and researchers to critically engage the two disciplines in an ongoing discourse. By combining research findings with real-world applications, the book aims to be of empirical and practical value. This book will provide an integrative coverage of theory and research on ToM or mentalization skills within the primary and secondary classrooms.

Surprisingly, despite the approximately five decades of research on ToM, little research remains on the social context of ToM development within later childhood and adolescence (Bialecka-Pikul et al., 2017, 2021, 2024; Bosacki, 2016; Devine, 2020; Hughes, 2016; Wellman, 2017). This dearth of research with older school-aged youth is puzzling for a number of reasons. First, from both neurobiological and social perspectives, direct comparisons between preschoolers and adolescents are problematic, and few studies take a relational or transactional model approach to development (Ghosh et al., 2024; Sameroff, 2009).

Thus, more research is needed to strengthen the connections between these two developmental periods. Another potential explanation of this lack of research could be that individual differences in young peoples' experiences during school-related transitions throughout childhood and

adolescence (preschool-kindergarten; elementary to secondary, and secondary school to university) are difficult to capture longitudinally, given the changes in schools and locations of children. In addition to methodological challenges, such transitions also bring a distinct widening of young people's cognitive skills, social tendencies, and emotional experiences (Chaku & David-Keane, 2024; Devine & Apperly, 2021; Goble et al., 2017; Sameroff & Mackenzie, 2013; Symonds & Galton, 2014).

In particular, school or academic-level transitions are typically accompanied by a steep increase in the complexity and importance of children's peer relationships (Devine et al., 2024; Gazelle, Lundin, & Bosacki, 2021; Gazelle & Faldowski, 2019; Hardy et al., 2002; Johansen et al., 2024; Jones, 2002; Lecce et al., 2024; Skymba et al., 2022), and psychosocial and emotional experiences and school engagement (Gillison et al., 2008; Goodenow, 1993; Sameroff, 2009). Relations among prosocial skills, school engagement, and academic achievement are not likely unidirectional, as recent research supports reciprocal and dynamic links among emotions, social interactions, and achievement (Bosacki et al., 2015, 2019a; Pekrun et al., 2017; Smogorzewska et al., 2022b). For example, Pekrun et al.,'s (2017) reciprocal model that suggest interconnections between academic emotions (e.g., boredom, shame, self-loathing, pride to name a few) and achievement, as well as dynamic systems and transactional models of development. These dynamic system models suggest a continuous and fluid interplay among children's social cognition, the affect on academic performance, and their relationships with a social context over the course of development (Bialecka et al., 2022; Fang et al., 2022; Ghosh et al., 2024; Papera et al., 2019; van Geert, 1998; 2018).

This dynamic system approach to development suggests that social cognition, emotional experiences, and social interaction are mutually related in circular causality, such that social interactions facilitate ToM development (Papera et al., 2019), and ToM development facilitates effective social interactions (Blijd-Hoogewys et al., 2022). Such dynamic and fluid models build on other systems theories such as interparental positivity spillover theory (Don et al., 2024), and the Broaden-and-Build theory of positive emotions (Fredrickson, 2001). This constructivist model of cognition, affect, and behavior allows for developmental continuity (Qiao-Tasserit et al., 2024), at the same time as creating potential for cognitive growth and emotional well being (de Ruiter, 2017; Sameroff, 2009; Sameroff & MacKenzie, 2003; Stifter et al., 2020).

Building on such dynamic system models (Papera et al., 2019; van Geert, 2018), the development of a child's emotional and cognitive well-being, positive social interaction skills, school engagement, and academic

achievement may form part of a dynamic system of influences across school transitions. Given this, educational interventions have the potential to alter children's developmental trajectories during any level of their education. For example, Goble et al., (2017) examined transactional relations among over 200 Head Start children's positive social interaction skills, school engagement, and academic achievement through a longitudinal panel model across the transition from preschool to first grade.

Results showed that Head Start children's positive social interaction skills and academic achievement in preschool positively related to kindergarten school engagement, positive social interaction skills, and school engagement influenced one another over time. Further support also exists for longitudinal relations among mindreading and prosocial skills (Jones et al., 2024), positive emotions, school engagement and academic achievement during daily school transition times such as in-class instruction to recess or lunch time, or the beginning and end of school days (Cook & Coley, 2017; Goble et al., 2017; Gazelle & Faldowksi, 2019).

Building on past research on kindergarten into primary school transitions (Cook & Coley, 2017; Cowan et al., 2005; Goble, 2017), future research can apply such developmental ecological models of transition to higher educational levels such as the transition from elementary to secondary school (Ghosh et al., 2024; Roorda & Bosman, 2022; Symonds & Galton, 2014), or secondary school to university (Cross, 2017; Grills-Taquechel et al., 2010). That is, given the evolving nature of relationships over time and generations such as parent-child, siblings (Dong & Chen, 2024), and peers, researchers need to explore how such interpersonal relations and related emotional experiences affect students' academic and psychosocial development particularly their ToM abilities (Hernandez et al., 2016; Lo & Mar, 2022; Sirsch, 2003; Wikle et al., 2019). In addition, past research suggests that teachers'social and emotional competencies may also influence their students psychosocial and academic outcomes (Jennings & Greenberg, 2009; Zang et al., 2019). Thus, researchers need to explore the influence of teacher-student relationships (Quenneville, Talwar, & Bosacki, 2021; Smogorzewska et al., 2022ab), and relationships with other adults in leadership positions on the development of children's mentalization and social-emotional skills across all grade levels (Pfister et al., 2024).

Accordingly, researchers focus on the developmental gains and individual differences in children's understanding of others' minds in later childhood and adolescence (Wellman, 2017, 2022). Given this gap in the literature, the focus of this book will be on ToM developments within childhood and adolescence within social and moral communicative contexts such as the school. In Chapters 4 and 7, I will specifically explore the roles

of parent-child, teacher-student relationships, and how teachers' beliefs, attitudes, and behaviors play in young people's ToM development and their psychosocial, emotional, moral, and academic lives in the classroom.

1.2. Gender-Sensitive and Culturally-Informed Developmental ToM Research

Given that the majority of early work on ToM was heavily restricted to mainly Western, English-speaking countries, another gap in the literature is the lack of gender-informed, cross-cultural research from diverse areas across the globe. In addition, given that most past studies focus mainly on neurotypical groups, this book will include a variety of studies that draw from typical development, as well as neurodiverse groups such as children and adolescents with learning and developmental exceptionalities. Such studies may include children and adolescents with developmental (e.g., autism) as well as emotional exceptionalities, including children with internalizing difficulties (e.g., social anxiety, depression) as well as externalizing difficulties (e.g., conduct challenges and impulsive behavior).

To summarize, I will draw on Theory of Mind, and related research on epistemic cognition, psychosocial and moral reasoning to inform readers about how teachers and peers influence young people's understanding of minds, and their sociomoral actions within the classroom. I will focus on the importance of relationships (teacher, parent, sibling, peer, animal) for collaborative dialogic learning and shared intentionality among children and adolescents. Overall, this book addresses the central question of what happens to young people's ToM development when they enter and travel through the school system? More specifically, how do children and adolescents learn to use ToM to navigate their learning journeys and their relationships with themselves and others?

Organization of the Book

This book is divided into four main sections (I - IV), consisting of 12 chapters. Each chapter will include the same organizational structure beginning with an introduction, followed by example studies reviewed across disciplines of developmental psychology, social neuroscience, and education, applications of the research findings to a learning context such as a classroom, future questions that suggest areas for future research and questions for readers to consider for future exploration, and finally, a conclusion that summarizes the chapter's contents and provides links to the next chapter.

Specifically, the book consists of four conceptually organized sections or 'Parts,' that frame the 12 chapters on Theory of Mind development within an educational context. Each of the four 'Parts' represents a conceptual organizer that contain two to four chapters that provide an in-depth analysis of relevant topics on social cognitive development and education in childhood and adolescence. In the following paragraphs, I will outline the four organizing sections and their corresponding chapters.

Part I focuses on the conceptual foundations of applied social cognitive developmental research within childhood and adolescence within the classroom. This foundational section contains three chapters beginning with the present introductory chapter, followed by the second chapter that will provide a critical overview of developmental and educational frameworks that aim to explain young people's social cognitive, moral, and socio-neurobiological development and teachers' socialization efforts. In particular, Chapter 2 focuses on the key definitions and theoretical models of developmental social cognition. That is, particular emphasis will be placed on Theory of Mind, and the corresponding research methods used in the past to study relations between children's and adolescent's ToM or mentalization skills (ability to interpret other's actions based on their mental states) and their socio-moral (reasoning about social and moral situations) and epistemic cognitive abilities (thinking about cognitive processes) and educational experiences. Chapter 3 highlights the importance of developmental socio-moral and epistemic cognitive research within the field of educational practice.

Parts II and III provide a critical overview of developmental neuropsychological research on the socio-moral cognition of self and others. The focus of Part II is on Theory of Mind and the process of learning. Each of the four chapters focuses on various aspects of Theory of Mind and learning in terms of attachment relations (parents, peers, teachers) with a focus on friendships in childhood (Chapter 4), adolescence peer relationships and identity formation (Chapter 5), conversations and collaborations with family, teachers, and peers (Chapter 6), and teachers' attitudes, beliefs, and communication methods (Chapter 7).

Part III details past research on young people's mental and moral health, and emotional and cognitive well-being within the context of Theory of Mind. In particular, Chapter 8 highlights the connections among Theory of Mind, Metacognition, and Emotional regulation within the classroom, Chapter 9 discusses the social cognition research on the various behavioral and emotional challenges experienced by young people within the classroom. Chapter 10 discusses recent human-animal interactions (HAI) and research on humane education and animal-assisted therapy and

learning, and will connect recent models of evolutionary morality and cognition to neurobiological and cultural models of attachment and social learning.

Finally, the fourth section—Part IV—will explore the theme of Future Questions with a particular focus on future research questions and implications for practice. Such questions will focus on the question of how to help young people to move forward towards a resilient and balanced life-style. To promote resilience and a culturally responsive and compassionate mindset among students, Chapter 11 focuses on the educational implications from studies that illustrate the connections among ToM, compassion and uncompassionate self and other-responding, mental toughness, and well-being within an increasingly diverse and digital and mobile learning context. Chapter 12 concludes the book with references to key research areas that require further investigation that move beyond social and moral cognition and learning into areas of developmental psychosocial neuroscience and neuroeducation. In this final chapter, I will also address the gaps or 'silences' and contradictions in the data throughout the past 10 chapters and suggest areas for future exploration.

This text aims to provide a critical and comprehensive coverage of the fundamental issues that pertain to social cognitive development during childhood and adolescence, and their implications for teaching and learning within the classroom. Please note that although I aim to provide an all-inclusive coverage of the latest in developmental social neuroscience research within an educational context, the coverage may be limited in several aspects. The majority of the works are published in English, and with a few exceptions, limited to published works and thus not academic conference reports or dissertations.

Given the extensive area of research and the rapid rate of growth of applied neuroscience research is occurring, I will aim to include—to the best of my knowledge—the most current and relevant resources, although this may not be completely exhaustive. For example, in a few instances the number of sources may be too numerous, and their relevance too peripheral to merit exhaustive coverage. To address this vast amount of research, in those instances I have decided to choose a few illustrative reflective examples to provide a summary. Despite these limitations, overall, my ultimate goal is for this book to provide a wide-ranging and evidence-based resource on developmental social cognition, learning, and peer relations for those who work with children and adolescents.

CHAPTER 2

THEORY OF MIND: THEORIES AND METHODS

Who has seen the wind?
Neither you nor I.
But when the trees bow down their heads.
The wind is passing by.
—Christina Rossetti, Who Has Seen the Wind? 1872 (from *Sing Song a Nursery Rhyme Book*).

2.1. Introduction

This chapter will provide the reader with an introduction to the term of "Theory of Mind," and a critical review of past and current theoretical models of the developmental social cognition such as neurobiological, psychocultural, ethological, among others. Past, present, and future ToM theories, research, and methods within childhood and adolescence will also be presented. The final section will discuss educational applications.

2.2. Research: Definitions and Theories – Developmental Social Network Science and ToM

The emerging field of social network neuroscience helps researchers to answer the question of how do brains shape our social worlds, and how do social worlds shape the brain? This relatively new field of inquiry combines theories of brain network dynamics with psychosocial dynamic network research (Falk & Bassett, 2017). Given the extreme complexity of the structure of our social worlds, network neuroscience provides new ways to understand the complex, multilayered patterns of structural connections and functional coupling in the human brain. In parallel, the social network analysis offers systematic ways to quantify social and cultural environments and interactions among individuals and groups.

Social neuroscience studies of brain network dynamics help researchers to understand how children learn to make sense of other people's actions in terms of mental states. That is, the process of mentalization that includes Theory of Mind (ToM) helps children to learn how they and others think and experience emotions (Becht et al., 2021; Guazzelli Williamson & Mills, 2022; Harris, 2022ab; Harris & Cheng, 2022; Wellman, 2017). For example, studies show that particular brain areas implicated in ToM enable the communication or reception of ideas and behaviors that may be connected (Perner et al., 2021; Poulin-Dubois, 2020). Recent advances in neuroscience suggest that these brain areas form neural hotspots within a broader, more dynamic neural network (Abu-Akel & Shamay-Tsoory, 2011; Nguyen et al., 2024). That is, as a child matures into adolescence (Symeonidou et al., 2020), individual brain regions interact with each other via measures of functional connectivity. These large matrices of myelinated neuronal axons provide a foundation for the synchronization of neurons (Bullmore & Bassett, 2011; Falk & Bassett, 2017; Fu et al., 2022).

To illustrate the neural connections that support links between mentalization skills and self-processes, Crone and Fuligni (2020) investigated the link between 8 to 25-year-olds' friendship quality and structure of the *social brain network,* or the brain regions involved in social cognition. Results showed, over time, stronger cortical thinning in the medial prefrontal cortex (mPFC) related to increasing levels of perceived friendship quality. More specifically, they found that increased difficulties in perspective-taking was linked to higher levels of loneliness and peer rejection.

The mPFC helps to guide the self-system such as self-referential processes that compare oneself to others, and enables one to integrate the perspectives of self and others (Chiu et al., 2024; Crone & Fuligni, 2020; Crone et al., 2022; Dahl, 2016). As such, accelerated cortical thinning of the mPFC might reflect regional specialization, or the fine tuning of the neural circuits related to mentalization processes of the self in relation to others. Thus, findings from such studies in youth suggest that the left and right temporoparietal junction (TPJ), and mPFC activity are connected within the context of friendship, and the perceptions of one's peer relationships (Crone et al., 2024).

These results, together with other studies that show adolescents choose friends with similar empathy levels (Miklikowska et al., 2020), suggest that experiences with friends may influence, and may be influenced by how young people process their identities within their social world. More recently, Chiu et al. (2024) found further support to show links between self-processes and mentalization as they found positive relations between

higher levels of self-referential source memory and emotion recognition proficiency in young adults. Such results hold implications for social-emotional programs that promote social skills and the development of quality peer relationships in the early school years (Najmussaqib et al., 2024). I will return the importance of mentalization skills in social-emotional functioning and the implications for education later on in further chapters.

Advances in neuroscience and computational science also provides researchers and educators with opportunities to consider the dynamics within and between brain networks (Isernia et al., 2020). The concept of neuroplasticity suggests that neural networks are in constant evolution as they change people's developing mental states and behaviors (Bullmore & Spoms, 2009; Falk & Bassett, 2017). Developmental cognitive neuroscience research studies show that during childhood and adolescence, neural region reconfigurations work together within a fluid, interconnected web to provide a view of constant brain activity (Blakewell, 2018). In contrast, a more modular view to the development of learning processes suggests that a given region in the brain tends to achieve a specific function in a relatively fixed manner (Sapolsky, 2017). Thus, the dynamic network perspective may increase the accuracy of the prediction of human social and moral behaviors.

For example, applied to the classroom setting, this dynamic network approach could help to explain why some students decide to take risks and collaborate rather than compete in social and academic settings (Bassett & Mattar, 2017; Güroğlu, 2022). In terms of social communication skills and fine motor skills or manual dexterity, studies show that ToM skills that are crucial for social interactions such as emotional recognition and perspective taking may help to improve, or be improved by fine motor skills (e.g., drawing, sewing, playing with puzzles, ball and balance tasks) (Fontes et al., 2024; Obeid et al., 2022; Tenebaum & Leonard, 2020). Such research on the development of neural pathways in the brain shows how mentalization skills and physical behavior such as fine motor skills connect with social communicative behavior (Gandotra et al., 2022; Schneider & Iverson, 2022).

Such studies may provide empirical evidence to help develop puzzle-based educational tools that are particularly appropriate for children and adolescents (Beauchamp & Anderson, 2010; Fontes et al., 2024; Tenebaum & Leonard, 2020). Studies that explore the social brain network and relationships in youth can provide ways to encourage youth to take a 'peer growth mindset,' and tailor social peer networks to maximize collaborative and individual learning, emotion regulation, and mentalization skills (Rambaran et al., 2022; Scheffleur & Cheung, 2019). I will elaborate on

such educational implications in further chapters.

To further build on this network approach or relational systems theory, consistent with developmental-evolutionary relational systems approaches (Buttelmann, 2022; Del Giudice, 2014; Bjorklund & Ellis, 2014; Overton, 2013; Sternberg, 2014), Tomasello (2014a, b) discusses an evolutionary-psychological perspective to explain the development of human social cognition. Tomasello and others (Buttelmann, 2022), build on comparative psychology with primates, to explain the shared intentionality hypothesis. Specifically, this research follows cultural theorists (Hegel, Vygotsky, Bakhtin), and the social infrastructurists (Mead, Piaget, Wiggenstein) who claim that inventiveness, or individual creativity is a person's ability to think within a sociocultural context.

Researchers continue to explore the question of what makes the human thinking process unique, as compared to the process of social transmission, that human culture is a process of social coordination. The shared intentionality hypothesis holds special relevance to the development of mindreading in that it claims that cognitive representation, inference, and self-monitoring distinguishes humans from primates (Buttelman et al, 2022; Tomasello, 1999; see Royka & Santos, 2022 for a brief review). Thus, to survive and thrive, building on these theories of evolutionary social-cultural development, these human abilities transformed twice during evolution. That is, humans first needed to coordinate their behaviors in collaborative activities, and then coordinate their intentional states through cooperative communication or conventional language.

However, before one begins to share intentionality, one must first develop an understanding of the mind, and individual intentionality (Bialecka et al., 2024; Carpendale & Lewis, 2020; Olson, 2022, 2023). Drawing on the philosophical belief-desire model of rational action (Chandler, 1990; Green et al., 2018), a goal or desire coupled with an epistemic relation to the world (e.g., a belief based on an understanding of the causal or intentional structure of the situation) (Fabricius et al., 1989; Fabricius & Schwanenflugel, 1994; Tomasello, 2020), creates an intention to act in a particular way. Such a flexible, self-regulated, and mindful way of acting is referred to as individual intentionality, and marks the beginning of epistemic cognition, or the way that people acquire, justify, and use knowledge (Green et al., 2018; Kuhn, et al., 2000; Perry, 1970). Thus, to take this intentional stance to understand and predict the behaviors of others (Taumoepeau et al., (2022), one must develop the capacity to attribute mental states to others (Dennett, 1978; Güroğlu, 2020).

This process of self-regulation allows a person to think reflectively during the process of thinking. That is, the ability to regulate or manage

one's emotions allows one to make decisions, solve problems, and to monitor one's actions as one meets a goal (Dweck, 1999; Korucu et al., 2017). Goal-achievement may be reached by imagining what would happen if an individual tried different actions in a situation (Shim et al., 2024), or if different external forces influenced one's behaviors before they act (Tomasello, 2014a). This process of imagining future scenarios represents an 'off-line'simulation of potential perceptual experiences in others (Bjorlund & Ellis, 2014).

Thus, as a prerequisite to think before acting in this way, an individual must possess the following three cognitive skills. First, one must cognitively represent life experiences to oneself "off-line." Second, one must simulate or make inferences that causally transform these representations, intentionally, and/or logically. Finally, one needs to self-monitor and evaluate how these simulated experiences might lead to specific behavioral outcomes—and thus, make thoughtful behavioral decisions (Chander et al., 2000; Ruffman, 2014; Tomasello, 2014b). Furthermore, the success or failure of a particular behavioral decision reflects the underlying processes of representation, simulation, and self-monitoring (Hofer & Sinatra, 2010; Sullivan & Ruffman, 2004; Tomasello, 2014a).

Regarding the social construction of cognitions and emotions, for social-communicative actions to occur, some unique cognitive tools are necessary. The skills for joint attention and shared intentionality, which first emerge around 8 to 12 months fulfill this need (Bialecka-Pikul et al., 2022; Bialecka et all., 2024; Kristen et al., 2011). These skills allow young children to engage in joint action with adults, as this social communicative action combines movement coordination and goal attainment (Bialek et al., 2022). As Mead (1934) emphasized, most neurotypical infants demonstrate a need to establish joint attention and a mental common ground about a situation in which they are currently engaged with mature family members. Such intentionally communicative actions ensure that children can share and develop their understanding of cognitions and emotions with others (Harris, 2022).

Studies also show the ability to understand and manage one's emotions as a mental construct continues to develop in similar ways through childhood and adolescence across diverse cultures (Harris & Cheng, 2022; Lee & Lee, 2024). Building on these theoretical claims, research shows that parents may engage in joint attention with their infants such as lateral joint attention, where parents observe their infants playing compared to engaging with their children (Brandone & Stout, 2023; Cheng & Harris, 2023). Similarly, research shows that although the ability to recognize mixed emotions remains challenging for those under approximately 10 years of

age across the globe, the integration of emotions may be experienced differently may differ across cultures (Cheng & Harris, 2023; Selcuk et al., 2023). For example, do children believe emotions of mixed valence co-exist (as found in US children, Cheng & Harris, 2023), or do they cancel each other out (as found in Chinese children, Cheng & Harris, 2023)? Such findings suggest the need for more work on how culturally diverse parenting practices may influence the development of the joint attention process, and the ability to mentalize and come to understand the thoughts and emotions of self and other.

2.3. Research: Social Cognition and ToM - Research in Children and Adolescents

Past research suggests that the behavioral changes that occur from childhood to adolescence, such as increased self-regulation or impulse control and autonomy, also reflect brain growth (Crone & Fuligni, 2020; Lagutatta et al., 2010; Korucu et al., 2017). Affect-focused changes such as self-consciousness, greater orientation away from parents and toward peers, heightened sensitivity to rewards and social acceptance, and increased sensation-seeking and risk-taking, may reflect greater emergence of mental health challenges that hinder social-emotional functioning (Norwich et al., 2022; Shulman et al., 2016). That is, given that such behaviors provide clues as to how the developing brain codes and generates responses to social, moral, and emotional information (Icenogle et al., 2017; Preckel et al., 2017; Sapolsky, 2017; Steinberg, 2008; Steinberg et al., 2017), researchers need to explore the neurobiological underpinnings, as well as the psychocultural context of such complex social learning experiences (Choudhury, 2023).

Past studies suggest that Theory of Mind (ToM) plays an instrumental role in social information processing as it refers to the ability of individuals to represent the mental states of others (e.g., intentions, desires, beliefs), and is essential to human uniqueness and interactions. Accordingly, for over fifty years, researchers continue to unravel how children develop knowledge about the mind (Bialecka et al., 2024; Carpendale & Lewis, 2020; Flavell, 1968, 1979), and make sense of emotions, sensations, and thoughts that make up mental life (Carey, 1985; Fu et al., 2022; Olson, 2022; Piaget, 1965). Studies show that 7- to 9-year-old children, and also adults, organize mental life into three fundamental components such as physiological abilities related to the body, social-emotional abilities related to the heart, and perceptual-cognitive abilities related to the body (Weisman et al, 2017).

Such human mindreading capacities help humans to develop a general sense of social-emotional and moral learning (Lee & Anderson, 2017;

Nelson, 2017; Pfister et al., 2024; Seucan et al., 2024; Wimmer & Perner, 1983). During this time, there was a widespread consensus that such capacities were constructed gradually over the course of the preschool years, and relied on linguistic and social and cultural input together with general-learning and theorizing abilities (Gopnik & Meltzoff, 1997; Wellman, 1990; 2014; 2017, Wellman, Cross, & Watson, 2001; Werker & Hensch, 2015). Although some researchers support the claim that basic mindreading abilities are innate, and that the appearance of development reflects failures of performance (Leslie, 1994; Scholl & Leslie, 1999), this has often been considered more of a minority position.

Regarding the development of ToM, within the last decade, the field of developmental and neurobiological social cognition has changed dramatically (Fu et al., 2022; Isernia et al., 2020; Perner et al., 2021). As Westra and Carruthers (2017) note, it is now widely agreed that these findings reflect a culturally-influenced underlying neurobiological network that leads to a social-cognitive competence of some sort (Bialecka et al., 2024; Carey, 1985; Nelson, 2017; although see Heyes, 2014a, for an alternate view).

One of the current debates include how early social-cognitive abilities develop in relation to those that underlie performance in more traditional verbal ToM tasks. To illustrate, nativists believe that findings support the claim that core mindreading abilities are present throughout infancy, and that early failures on verbal tasks reflect performance difficulties (Baillargeon, Scott, & He, 2010; Carruthers, 2013). In contrast, the majority of social constructivists (i.e., those whom believe that knowledge is socially constructed and follow a constructivist epistemology), have mostly converged on some form of two-systems view.

According to this view, there is an early-developing, implicit system that shows limited-flexibility later supplemented by a gradually acquired, flexible, and explicit theory of mind (Apperly, 2012; Weimer et al., 2017, 2018; 2021; Wellman, 2014; 2017). For example, when a child acquires a constructivist ToM, they become ‘perspectival’ in that they move from a dichotomous, "true/false" view of knowledge and mind, to a more constructivist or "degrees of certainty" view (Blakemore & Mills, 2014; Larson, 2011; Tomasello, 2020). Such a constructivist view of ToM involves the understanding that interpretive and active cognitive processes influence one’s knowledge, judgements, and decisions (Bialecka et al., 2024; Carpendale & Lewis, 2020). This process is also referred to as naïve or realist epistemology, and allows individuals to develop an awareness and acceptance of uncertainty and multiplicity of interpretation, usually during later childhood and early adolescence (Chandler et al., 1990; Fabricius et al., 1989; King & Kitchener, 1994).

More specifically, this two-systems hypothesis espouses the existence of two ToM systems: one that is implicit and involves the automatic analysis of the belief states of others. The second system is not automatic, and is involved in explicit reasoning about others' mental states. Although various terms have been used to describe the two levels (e.g., automatic, implicit, ToM efficiency, and the second system referred to as a flexibility or explicit ToM), many studies draw on the terminology developed by Apperly and Butterfill (2009) who claimed that ToM includes automaticity and flexibility in reasoning about mental states.

According to Apperly and Butterfill (2009), as children develop they may become more efficient and flexible in their reasoning about others' minds (Apperly & Butterfill, 2009; Baron-Cohen, 1995). Apperly and Butterfill (2009) argue that greater efficiency in adult ToM reasoning may stem from the process of automatization. That is, the mental mechanisms involved in adults' reasoning about the mental world that often involve highly familiar, well-learned, and practiced situations and habitual responses, require minimal cognitive effort (Weisman et al., 2017). That is, they learn that expectations or predictions about future behavior are based on learned mental scripts about our past experiences with others (Sullivan & Ruffman, 2004).

According to Westra and Carruthers (2017), there are, in general, two lines of support for this constructivist position. One consists of evidence that both implicit and explicit systems exist alongside one another in adults, and that the implicit system operative in infancy has signature limits (Apperly, 2012; Schneider, et al., 2017). Past research shows that response times and errors on tasks of perspective taking and belief–desire reasoning, decrease with age, indicating increased efficiency and automaticity (Dumontheil et al., 2010; Hayward & Homer, 2017). Such evidence suggests that as children develop, they increase their ability to imagine multiple potential hypotheses to explain others'sociomoral behaviors (Baird & Astington, 2004; Seucan et al., 2024). Thus, the ability to become flexible in one's thinking, and realize the diversity in the mental states of others also continues to develop.

Further, Apperly and Butterfill (2009) argue that once children master the concept of belief, they become more flexible in their ability to reason about mental and moral states, and their mental efficiency continues to develop into adulthood. The ability to be flexible in how one reasons about sociomoral situations allows individuals to engage in what Apperly and Butterfill refer to as "top-down guidance of social interaction," or the anticipation of others' beliefs and intentions, as well as "explicit reasoning about the causes and justifications for mental thoughts" (p. 966). Thus,

Apperly and Butterfill's (2009) theory suggests that neurotypical children acquire more advanced social cognitive and moral skills with age, and they gradually learn how to apply them with greater flexibility to novel or ambiguous situations. Given the ongoing debate about how ToM develops throughout the lifespan (Carruthers, 2016a, 2016b), other views remain in contention.

The second line of support derives from evidence of a systematic and orderly progression in toddlers' verbally-manifested mindreading abilities, which may suggest conceptual development. This support is most clearly demonstrated by Wellman and colleagues who havecreated and validated across cultures the mindreading scale. For example, Wellman and Liu (2014) found that across most cultures, typically developing (TD) or neurotypical children developed ToM abilities in the progression of Diverse Desires (DD), Diverse Beliefs (DB), Knowledge Access (KA), False Beliefs (FB) and Hidden Emotion (HE) (Wellman & Liu, 2004). In contrast, a different sequence in the scaling of ToM development has also been found—such that, in a study on children from Australia and Iran, children from Iran learned KA before DB, whereas children from Australia's order of learning was reversed (DB before KA) (Shahaeian et al., 2014).

Thus, as Taumoepeau et al. (2022) suggested, children from more individualistic cultures (USA, Australia, Canada) tend to achieve understanding of diverse beliefs before knowledge access. In contrast, children from collectivist cultures (non-Western countries) tend to understand knowledge access first then diverse beliefs. Such findings may reflect the influence of socialization that focuses on norms and obligations on children's mentalization skills (Lee & Lee, 2024). For example, interdependent or collectivist cultural mandates emphasize group harmony and a relational self-concept and growth-focused mindset (Rambaran et al., 2022; Sheffler & Cheung, 2019). In contrast, more independent and individualistic societies promote the importance of the individual mind with internal state attributes and individual autonomy (Taumoepeau et al., 2022, 2019).

However, Westra and Carruthers (2017) claim that the data provided by Wellman and Liu's (2014) mindreading scale failed to support a constructivist model of ToM development. That is, many plausible mostly pragmatic alternative explanations could exist, especially those that have not yet been controlled for and excluded. In particular, Westra and Carruthers' (2017) argue that it takes the majority of children some time to figure out that cognitive states can be a topic of conversation. That is, most neurotypical children need time to develop the pragmatic skills required to discern when and how mental states become integrated into a conversation. In addition, some cultures rarely use mental state words, and often omit the