



THEORY OF MIND IN EDUCATION: CONCEPTS, DEVELOPMENT, AND IMPLICATIONS FOR TEACHING PRACTICES

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ABSTRACT

Theory of Mind (ToM) is a crucial ability in social-cognitive development that enables individuals to understand others' thoughts, beliefs, intentions, and emotions. This study aims to examine the fundamental concepts of ToM, its developmental stages, its neurobiological underpinnings, and its implications for educational practice, particularly in the context of classroom learning and teacher-student interactions. Using a Systematic Literature Review (SLR) approach, this study synthesizes findings from psychology, neuroscience, and education to examine four main aspects: theoretical models of ToM, developmental stages, neurological foundations, and educational implications. The findings indicate that ToM develops progressively, beginning with joint attention in infancy and advancing toward the ability to understand false beliefs, irony, and complex social perspectives in late childhood. Neuroscientific evidence confirms that ToM is processed through the social brain network, which includes the medial prefrontal cortex, temporo-parietal junction, superior temporal sulcus, and the mirror neuron system. In educational contexts, ToM significantly influences teachers' ability to build empathic interactions, support collaborative learning, and enhance effective classroom management. Furthermore, Islamic educational values such as rahmah, adab, and ihsan inherently strengthen the development of ToM through exemplary conduct and dialogic interaction. This study concludes that ToM is an essential competency that needs to be integrated into instructional design, curriculum development, and teacher training programs.

Keywords: Theory of mind; Social cognition; Mentalizing; Child development; Neuroscience of learning; Collaborative learning; Teacher-student interaction; Educational psychology; Empathy; Islamic education

1. INTRODUCTION

Theory of Mind (ToM) is one of the fundamental concepts in developmental psychology, social psychology, and neuroscience, as it is directly related to the ability of individuals to understand the thoughts, beliefs, intentions, and emotions of others (Premack & Woodruff, 1978). In educational contexts, this ability serves as an essential foundation for communication and

teaching–learning interactions. Whenever teachers provide instructions, conduct assessments, or guide students, they are inherently engaged in mentalizing processes: interpreting what students know, how they feel, and how they make sense of information. Likewise, students require ToM to comprehend teachers’ intentions, collaborate with peers, and navigate the social dynamics of the classroom (Wilde Astington & Edward, 2010).

The importance of ToM is increasingly evident in modern education, which emphasizes social-emotional competence, communication, collaboration, and empathy as key twenty-first-century skills. Limited ability to understand others’ perspectives may lead to various challenges in schools, such as peer conflict, miscommunication between teachers and students, low social sensitivity, and weak engagement in collaborative learning. At the elementary level, children are in a critical phase of social-cognitive development; thus, teachers need a strong understanding of how ToM develops and how it can be integrated into instructional practice (Wellman, 2017).

A growing body of research shows that ToM development results from the interaction of biological factors, language, parenting styles, and the social environment (Carpendale & Lewis, 2006). Children who frequently engage in dialogue, discussion, and emotionally rich interactions tend to exhibit stronger ToM development. In the Indonesian cultural context, social practices such as *musyawarah*, traditional storytelling, habituation of *adab*, and religious learning play a significant role in shaping the ability to understand others’ perspectives (Kuntoro et al., 2017). This indicates that ToM is not only influenced by individual factors but is also deeply connected to the social and cultural values embraced by a community.

In Islamic education, the ability to understand oneself and others is a central component in shaping students’ moral character and personality. Values such as *rahmah* (compassion), *ihsan* (optimal benevolence), and *adab* in social interaction are directly connected to mentalizing ability or Theory of Mind (ToM). Classical Islamic educational traditions place strong emphasis on internal processes such as *muhasabah* (self-reflection), emotional regulation, and the capacity to take another person’s perspective as core elements in forming a virtuous character. This is evident in the pedagogical approaches of scholars such as Al-Ghazali, who emphasized understanding the inner state of learners before offering advice or instruction. Thus, Islamic educational values inherently support the development of children’s social-cognitive capacities through consistent reflective and interpersonal processes (Raychan Assabiq & Wantini, 2024).

The learning process in Islamic tradition also emphasizes exemplary conduct (*uswah hasanah*), dialogue, *musyawarah* (consultation), and empathetic interaction, which provide an ideal social environment for ToM development. Humanistic teacher–student interactions allow children to learn how to recognize others’ emotions, intentions, and perspectives through direct experience—aligning with developmental psychology findings that social environments play a crucial role in the growth of ToM (Carpendale & Lewis, 2006). When students engage in discussion-based activities, cooperative tasks, or moral habituation practices, they simultaneously develop social-cognitive skills such as perspective-taking, affective empathy, and emotional regulation. Therefore, integrating Theory of Mind into instructional practice is not only aligned with psychological principles but also strengthens the aims of Islamic education, which focus on cultivating individuals with noble character.

The novelty of this study lies in its integrative perspective on Theory of Mind (ToM), which synthesizes insights from developmental psychology, neuroscience, and pedagogy within the context of elementary and Islamic education in Indonesia. While ToM plays a central role in learning and social interaction, in-depth studies on its application in school settings—particularly in primary and Islamic education in Indonesia—remain limited. Most existing research

conceptualizes ToM primarily as a developmental or clinical construct, focusing on child development, neuropsychological disorders, or laboratory-based investigations, with relatively little attention to pedagogical contexts, classroom interactions, and instructional design (Baron-Cohen et al., 2013). In contrast, this review positions ToM as a foundational pedagogical competence that underpins empathetic teacher–student interaction, collaborative learning, and character education informed by cultural and religious values.

Based on this background, the present article aims to provide a comprehensive understanding of Theory of Mind within educational contexts. The objectives of this study are: (1) to explain the concepts and theoretical models of ToM, (2) to describe the developmental stages of ToM in children, (3) to analyze the neurological foundations of ToM, and (4) to elaborate on the implications of ToM for educational practice, including teacher–student interaction, collaborative learning, classroom management, character education, and technology-enhanced learning. Accordingly, this article is expected to serve as a reference for teachers, researchers, and education practitioners in developing more humanistic, empathetic, and socially responsive learning practices that address students’ social-cognitive needs.

2. METHODS

This study adopts a Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize scientific findings related to Theory of Mind (ToM) and its implications within educational contexts. The SLR approach was selected because it provides a systematic, structured, transparent, and replicable framework that enables a comprehensive mapping of theoretical developments, empirical evidence, and the applied relevance of the ToM construct (Snyder, 2019). The SLR procedures in this study follow the guidelines proposed by Kitchenham and Charters (Barbara Kitchenham & Stuart M. Charters, 2012), consisting of three main stages: planning, conducting, and reporting. In the planning stage, the researchers defined the scope of the review, established the research objectives, and formulated inclusion and exclusion criteria to ensure a consistent focus throughout the review process. Four central research questions were developed, namely: (1) how ToM concepts and theoretical models are described in the scientific literature; (2) how ToM develops in children according to empirical findings; (3) what neurological foundations underlie ToM; and (4) how ToM is applied in educational practice. These questions ensure that the review addresses not only the theoretical dimension of ToM but also its empirical grounding and practical relevance in modern education.

The SLR was conducted through a systematic search of literature using reputable international academic databases such as Scopus, Web of Science, ERIC, ScienceDirect, and SpringerLink, supplemented by additional sources such as Google Scholar and DOAJ. The search employed combinations of keywords and Boolean operators and covered publications from 1978 to 2025 to represent both classical and contemporary ToM research. Inclusion criteria consisted of peer-reviewed publications that directly examined ToM concepts, developmental trajectories, or educational implications, written in English or Indonesian, and available in full-text form. Meanwhile, non-scientific publications, popular reviews, duplicate records, and studies irrelevant to educational contexts were excluded from the sample. The selection process followed the PRISMA flow, beginning with initial identification of articles, screening based on titles and abstracts, assessment of full-text eligibility, and ending with the inclusion of studies that met all selection criteria. Articles that qualified were then processed using a structured extraction sheet covering authors, year, research aims, methodology, main findings, and contributions to ToM scholarship. Data analysis employed a thematic synthesis approach (Thomas & Harden, 2008),

which involved open coding, thematic grouping, and cross-theme integration. This process resulted in four major themes: ToM concepts and theoretical models, ToM developmental trajectories, neurological foundations of ToM, and educational implications of ToM. The validity and reliability of the review were maintained through systematic search procedures, the use of high-quality sources, and consistent coding across all included articles.

3. RESULTS AND DISCUSSION

This section presents a synthesis of the literature on Theory of Mind (ToM) and its implications for education. The discussion integrates research from developmental psychology, neuroscience, education, and cross-cultural studies.

Conceptualization and Theoretical Models of Theory of Mind

Theory of Mind (ToM) refers to the ability to understand the thoughts, beliefs, intentions, and emotions of others (Apperly, 2012; Premack & Woodruff, 1978). This ability forms the foundation for predicting behavior and enabling effective interpersonal communication. In educational contexts, ToM is essential for comprehending teacher instructions and facilitating social interaction in the classroom (Henderson et al., n.d.; Wilde Astington & Edward, 2010).

Several theoretical models explain how ToM develops. The *Theory-Theory Model* emphasizes that children construct mental theories through inference and social learning (Apperly, 2012; Gopnik & Wellman, 1992). The *Simulation Theory* argues that individuals understand others by internally simulating their mental states (Blair, 2005; Frith & Frith, 2007). The *Modular Theory* posits that ToM is a specialized cognitive module supported by dedicated neural structures (Sabbagh, 2004; Simon Baron-Cohen, 1995). Meanwhile, the *Executive Function Theory* highlights the role of executive processes—such as working memory and inhibitory control—in ToM development (Apperly, 2012; Lecce et al., 2017; Wellman, 2014).

This multidisciplinary perspective demonstrates that ToM is not merely a cognitive phenomenon but also neurobiological and social in nature. Through the integration of various theoretical approaches—from the cognitive construction emphasized in Theory-Theory, the internal simulation processes in Simulation Theory, the modular assumptions of Modular Theory, to the influence of executive functions—Theory of Mind emerges as a complex ability that cannot be explained solely as a cognitive process. Its development and functioning are shaped by the interaction between neurobiological mechanisms, such as the activation of cortical areas responsible for perspective-taking and social inference, and children's social experiences within families, schools, and cultural environments that shape their everyday mentalizing capacities (Carpendale & Lewis, 2006; Hughes & Dunn, 1998). Therefore, ToM must be understood as a multidimensional construct developed through the interplay of brain structures, cognitive processes, and social stimulation, making its understanding and application in education necessarily holistic and attentive to all three dimensions.

Stages of Theory of Mind Development in Children

The development of Theory of Mind (ToM) occurs gradually from infancy. Between 0–12 months, infants exhibit joint attention, which forms the foundation of mentalizing capacity (Ágnes Melinda Kovács et al., 2010; Carpendale & Lewis, 2006). At 18–24 months, children begin to engage in pretend play, marking the emergence of symbolic representation (Angelina Lillard, 1998).

The ability to understand false belief typically appears around ages 3–4, representing a major milestone in ToM development (Lecce et al., 2017; Wellman, 2017). Between ages 6–8, children develop the capacity to comprehend irony and more complex social perspectives (Astington et al., 1989; Fink et al., 2014). By ages 10–12, they are able to understand faux pas and interpret abstract social meaning at a more advanced level (Bosacki, 2000; Hala, 2010). The term *faux pas* originates from French, meaning “a misstep.” In the context of Theory of Mind and social psychology, a faux pas refers to a social mistake in which someone says or does something inappropriate, offensive, or insensitive—usually unintentionally—because they fail to consider another person’s feelings or knowledge. For example, a child saying, “Your house is really small,” without realizing the comment might hurt a friend’s feelings. The ability to detect faux pas indicates that children can identify unintentional social mistakes, evaluate social contexts more complexly, and consider two perspectives simultaneously. This ability typically matures between the ages of 10–12.

Sociocultural constellations significantly shape the development of ToM, as children’s ability to understand others’ thoughts and emotions is closely tied to cultural values, parenting practices, and social interaction patterns in their environment. Cross-cultural studies show that Indonesian children exhibit distinct and unique ToM developmental patterns compared to children from Western societies. These differences emerge partly because Indonesian culture is more collectivistic, emphasizing social harmony, obedience, and interpersonal sensitivity. As a result, children may demonstrate earlier development in certain aspects of social perspective-taking but show variability in ToM tasks that require individual expression or explicit reasoning. Findings by Kuntoro et al. and Peterson et al. confirm that ToM development is not universally linear but is strongly influenced by the cultural context in which children grow.

Neurological Foundations of Theory of Mind

Neuroscientific research demonstrates that Theory of Mind (ToM) does not operate independently of biological structures; rather, it relies on the coordinated functioning of the *social brain network*, a set of brain regions specifically involved in social understanding and mentalizing. One of the primary components of this network is the Medial Prefrontal Cortex (mPFC), which plays a crucial role in representing intentions, evaluating others’ mental states, and performing higher-level social inferences. Activity in the mPFC enables individuals to interpret others’ goals and motivations, forming the basis for understanding internal mental states that cannot be directly observed (Abu-Akel & Shamay-Tsoory, 2011; Frith & Frith, 2007).

Another key region is the Temporo-Parietal Junction (TPJ), which is essential for understanding *false belief*—the ability to recognize that others may hold beliefs that differ from reality or from one’s own beliefs. The TPJ also supports perspective-taking, one of the core skills underlying ToM and cognitive empathy (Saxe & Kanwisher, 2003).

Furthermore, the Superior Temporal Sulcus (STS) is involved in processing nonverbal social cues such as gaze direction, facial expressions, and body movements. The STS enables individuals to detect and interpret subtle changes in social behavior, providing critical sensory information for the mentalizing process (Frith & Frith, 2007).

These regions work in conjunction with the mirror neuron system, which activates both when an individual performs an action and when observing someone else performing the same action. This system contributes to action simulation and empathy by enabling individuals to internally “mirror” or simulate others’ emotional experiences (Rizzolatti & Craighero, 2004).

Collectively, these four brain areas operate synergistically to form the neurobiological basis of ToM. Thus, the capacity to understand others' thoughts and emotions results from complex interactions among distinct yet interconnected neural structures.

Dysfunction or irregular activity within these brain regions is often observed in individuals with autism, explaining their difficulties in perspective-taking, emotion recognition, and flexible social interaction. These neuroscientific findings strengthen the understanding that social-cognitive abilities have a clear biological foundation, underscoring the need for educational interventions that consider neurobiological aspects when supporting ToM development (Simon Baron-Cohen, 1995).

Implications of Theory of Mind for Learning

1. Teacher–Student Interaction

Teachers with a strong understanding of Theory of Mind (ToM) are able to adjust instructional strategies more effectively because they can identify variations in students' cognitive and emotional states, including recognizing misconceptions before they hinder the learning process. This mentalizing ability enables teachers to read various nonverbal signals that emerge during classroom interactions—such as expressions of confusion, signs of anxiety, discomfort, or interest in the material. By being sensitive to these cues, teachers can respond more empathetically and adaptively, for example by providing additional explanations, modifying instructional approaches, or offering necessary emotional support. This ability not only enhances the quality of teacher–student interactions but also fosters a more inclusive, supportive, and responsive learning environment tailored to students' individual needs (Carpendale & Lewis, 2006; Hughes & Dunn, 1998; Simon et al., 2025).

2. Collaborative Learning

Theory of Mind plays a key role in enhancing the effectiveness of group collaboration, discussions, and project-based learning because perspective-taking allows students to understand the viewpoints, intentions, and contributions of other group members, leading to more harmonious and productive coordination, negotiation, and decision-making (Joshua W Buckholtz & René Marois, 2012; Rizzo & Killen, 2016; Wilde Astington & Edward, 2010). In collaborative learning contexts, students with strong ToM abilities tend to manage differences in opinion more effectively, show tolerance for others' ideas, and participate constructively in collective problem-solving. Research consistently shows that pedagogical interventions such as role play, interactive games, and social simulations significantly improve children's ToM skills, as these activities provide safe and structured opportunities for students to practice perspective-taking, empathy, and social understanding (Fink et al., 2014; Musthofiyyah et al., 2025). Thus, integrating mentalization-stimulating strategies not only enhances social competence but also supports the overall effectiveness of collaborative learning.

3. Classroom Management

Understanding ToM enables teachers to view problematic behaviors as reflections of students' mental states—such as confusion, anxiety, or difficulty understanding others' perspectives—rather than simply as violations that must be punished. This perspective allows teachers to assess situations more empathetically and identify underlying causes of behavior, such as limited emotional regulation or challenges in reading social cues. Such an approach aligns with restorative classroom management principles, which emphasize relationships, dialogue, and repair, ensuring that interventions focus not only on sanctions but also on social–emotional

learning that supports students' healthy and responsible development (Blair, 2005; Frith & Frith, 2007).

4. Character Education and Social-Emotional Learning

ToM underlies empathy, emotional regulation, and healthy social relationships (Bosacki, 2000; Wellman, 2017). In Islamic education, values such as *rahmah* (compassion), *ihsan* (excellence in doing good), and *adab* (ethical conduct) align with the capacity to understand others' mental states, as they emphasize care, social sensitivity, and wise behavior (Huzaimah Aspuri, 2025). Integrating these values with an understanding of ToM development can help teachers foster more empathetic classroom interactions. Social-emotional learning (SEL) programs have also been shown to enhance ToM and students' moral skills, making them highly valuable for strengthening character formation and socio-emotional maturity (Magfirah Magfirah & Daroe Iswatiningsih, 2025; Majidah & Ahmadi, 2024).

5. Educational Technology

Digital simulations, avatar-based games, and AI-driven interactive technologies can strengthen mentalizing processes by providing safe and flexible environments for students to practice perspective-taking without direct social pressure. Through immersive experiences, students can explore different social scenarios, observe the emotional responses of virtual characters, and take on different roles to understand how thoughts, goals, and emotions shape behavior. These technologies also offer immediate feedback that helps students evaluate their interpretations of others' mental states, supporting more structured and reflective development of ToM. Thus, AI-based digital media have strong potential as effective tools for enhancing ToM continuously (Ágnes Melinda Kovács et al., 2010; Frith & Frith, 2007).

Challenges and Opportunities

The main challenges in implementing Theory of Mind in Indonesia include teachers' limited understanding of children's socio-cognitive development, the dominance of teacher-centered instruction that restricts opportunities for perspective-taking, and the lack of robust social-emotional learning programs that are essential for stimulating mentalization skills (Henderson et al., n.d.; Muhammad Jitu et al., 2025; Musfah & Herlanti, 2017). Nevertheless, significant opportunities exist through the application of the *Kurikulum Merdeka*, which emphasizes active and differentiated learning; the strengthening of Islamic educational values such as empathy, *rahmah*, and *adab*; and the use of educational technologies that support richer and more adaptive perspective-taking practice. Moreover, recent findings in social-cognitive and neuroscience research provide strong scientific foundations for designing more effective interventions to enhance ToM among Indonesian students (Abu-Akel & Shamay-Tsoory, 2011; Kuntoro et al., 2017).

4. CONCLUSION

This study affirms that Theory of Mind (ToM) is a fundamental capacity in social-cognitive development with substantial implications for educational practice, particularly within elementary education and Islamic education contexts. Through a Systematic Literature Review approach, this research identifies four key dimensions of ToM: its conceptual and theoretical models, developmental stages, neurobiological foundations, and its implications for learning practices. The synthesis of literature demonstrates that ToM is not merely a cognitive ability to understand others' thoughts and emotions, but a competence shaped by complex interactions among biological factors, social environments, language, parenting styles, and cultural as well as religious

values. ToM develops progressively from infancy through adolescence, with major milestones such as joint attention, pretend play, false belief understanding, and the ability to comprehend irony and faux pas.

This review also shows that ToM is grounded in the coordinated functioning of the social brain network—including the mPFC, TPJ, STS, and the mirror neuron system—all of which contribute to mentalization, perspective-taking, and empathy. Understanding this neurological foundation provides educators with essential insights for designing learning interventions aligned with children's social-cognitive development. The findings further highlight that ToM significantly contributes to improving teacher–student interactions, supporting collaborative learning, strengthening empathetic classroom management, and serving as a core element in character and socio-emotional education. The integration of Islamic educational values—such as *rahmah*, *ihsan*, and *adab*—illustrates that Islamic education inherently supports the development of ToM through modeling, dialogue, and deliberation.

Thus, ToM should be regarded as an essential competency that requires focused attention in instructional design, teacher training, and school curricula. This study opens opportunities for further empirical research to develop effective classroom-based interventions to stimulate ToM, especially within the Indonesian educational context, which is rich in cultural, social, and religious dimensions.

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