CHAPTER 12

THEORY OF LEARNING, THEORY OF TEACHING, AND THEORY OF MIND

How Social-Cognitive Development Influences Children’s Understanding of Learning and Teaching

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One of the fundamental goals of research in cognitive development is to describe how children learn. Young children have powerful learning mechanisms for incorporating observed data with existing knowledge (see e.g., Griffiths, Sobel, Tenenbaum, & Gopnik, 2011). But young children also lack particular metacognitive abilities that prevent them from reflecting on how learning occurs or how beliefs change (e.g., Dunbar & Klahr, 1989; Klahr, 2000; Kuhn, 1989; Schauble, 1990, 1996) and possibly from introspecting in general (e.g., Flavell, Green, & Flavell, 1995). These difficulties do not mean that young children cannot learn. Rather, they suggest that young children might engage in the process differently than older
children, reflect on their knowledge differently, and for the purposes of the present chapter, conceptualize the process of learning differently than older children.

At the same time, children’s teaching has been described as “natural cognition” (Strauss, 2002). Teaching is a common behavior children engage in from early on and is clearly related to children’s developing knowledge of their own and others’ mental states (e.g., Astington, & Pelletier, 1996; Strauss, Ziv, & Stein, 2002; Wellman & Lagattuta, 2004; Ziv & Frye, 2004; Ziv, Solomon, & Frye, 2008; although see Davis-Unger & Carlson, 2008, for an alternative view). Many of these investigations suggest that how children engage in teaching others and how they understand the process of teaching (i.e., who needs to be taught or how that teaching will take place) is a function of what children know about how their own and others’ beliefs are formed and change.

These two literatures for the most part have developed independently, and while both have seen significant advances in what we know about children’s learning and teaching, there is much to be gained from integrating these two approaches. This is the goal of this chapter. We will argue that what a child understands about the ways learning and teaching are accomplished are deeply dependent upon the child’s developing metacognitive knowledge.

We divide our review into three sections. First, we examine what children might know about learning as a mental process and how their understanding of learning concepts potentially develops. Second, we investigate children’s developing understanding of teaching—when and how to communicate information to others to provide them with information they did not previously possess. Finally, we consider how these concepts potentially develop in high-functioning children with Autism Spectrum Disorder, who are known to lack particular skills in social cognition.

CHILDREN’S DEVELOPING CONCEPTS OF LEARNING

What do young children know about the process of learning—the circumstances under which ignorance is replaced by knowledge or knowledge changes based on information available in the environment? A good starting point for answering this question is what children know about their own knowledge, and there is evidence that such awareness is present at early ages. For instance, children use the word know in their spontaneous conversational utterances by age 3 (Shatz, Wellman, & Silber, 1983). Very young children also understand the difference between knowing and not knowing (e.g., Pillow, 1989; Pratt & Bryant, 1990). Between the ages of 3 and 5, children learn to recognize that beliefs can be false (e.g., Perner, Leekham, & Wimmer, 1987; Wimmer & Perner, 1983), the difference
between knowledge and ignorance (e.g., Hogrefe, Wimmer, & Perner, 1986), when their own beliefs have changed (e.g., Gopnik & Astington, 1988), and the difference between their own knowledge and that of another person (Wimmer, Hogrefe, & Perner, 1988). Moreover, during this age, children recognize that others’ false beliefs can arise from misconceptions about specific pieces of information (e.g., being told that “cats can read”) (Flavell, Mumme, Green, & Flavell, 1992) or from naturally occurring thoughts (e.g., such as that others cannot hold the appearance/reality distinction) (see Miller, Holmes, Gitten, & Danbury, 1997). In general, during this time, children appreciate that others can hold beliefs contrary to the actual state of the world and that they themselves can hold such false beliefs (for a review, see Wellman, Cross, & Watson, 2001).

Generally, however, preschoolers do not understand where their knowledge comes from or that they have acquired a new piece of knowledge. For instance, when taught new pieces of knowledge, young preschoolers typically claim that they knew it all along (Esbensen, Taylor, & Stoess, 1997; Taylor, Esbensen, & Bennett, 1994). Similarly, while 4-year-olds might understand that their knowledge changes, it is not until later in development that they can track how they know that change occurred (e.g., Gopnik & Graf, 1988). Further, 4-year-olds’ understanding of the indeterminacy of belief is limited (Kuhn, 2002), that is, young children lack the metacognitive knowledge that beliefs can be variable and can change given novel data (e.g., Carpendale & Chandler, 1996; Eisbach, 2004; Kuhn, Cheney, & Weinstock, 2000).

As children come to understand that mental states are related and intertwined with others, they also become more aware of the indeterminacy of mental states. For instance, Eisbach (2004) demonstrated that between the ages of 4 and 7, children become more aware that beliefs can lead to other beliefs in a variable manner, that is, two people who initially see the same percept can have different subsequent beliefs about that percept (if you and I see a bear, I might think of a trip to the zoo while you might think about your favorite childhood toy). To use Miller’s (2000) terminology, while young children may understand the situational characteristics of how beliefs are derived from information, they potentially do not understand how different individuals might bring different pieces of knowledge to a situation and apply that knowledge differently.

To investigate some of these issues, Sobel (2012) considered the difference between preschoolers’ understanding of learning as recognizing that someone’s knowledge has changed as opposed understanding someone is capable of a particular act. Learning requires a knowledge or belief change; if children’s judgments of learning focus only on the outcome, they should not distinguish learning from various other factors (e.g., luck) that could be responsible for that outcome.
In one experiment, children heard stories about characters who initially did not know a piece of information (e.g., how to solve a set of puzzles) and were exposed to a teacher who worked with them to teach them how to solve the puzzles. Of particular interest were *conflict* stories, in which the character made a claim about whether s/he learned how to solve the puzzles after the teacher’s intervention, which conflicted with the character’s ability to demonstrate that knowledge (i.e., the character could have claimed she learned how to solve the puzzles but failed to solve them later or the character could have claimed she did not learn how to solve the puzzles but could solve them later).

Three-year-olds did not make systematic responses when asked whether the characters learned the puzzles, while 4-year-olds reliably used the character’s demonstrative abilities, and overall, the usage of these demonstrative abilities correlated with children’s performance on a standard measure of false belief (i.e., Perner et al., 1987), in which children must recognize that another has a belief different from the actual state of the world. Critically, in another experiment, Sobel (XXXX) replicated this procedure without informing children at the onset of the story that the character was ignorant. In this case, in which the stories were not about the indeterminacy of the character’s beliefs, 3-year-olds’ performance improved. They, like 4-year-olds, responded based on the character’s demonstrative actions and not their claims about whether they learned (and responding was no longer related to children’s false-belief capacities).

These data suggest that preschoolers are sensitive to judgments about the indeterminacy of beliefs when making judgments about whether others have learned. However, this work only focuses on children’s appreciation of the role that changing beliefs has in learning. What about other mental states? Sobel, Li, and Corriveau (2007) hypothesized that the theory of mind literature also provides a blueprint for how children develop their conceptualization of the learning process. Following other research in theory of mind (e.g., Bartsch & Wellman, 1995; Wellman, 1990), children start with a relatively immature concept based on desires: a learner’s desires underlie whether information is learned, regardless of their other mental states. After age 4, children might realize the importance of noise-level and the importance of interest in paying attention to a particular topic (e.g., Miller & Zalenski, 1982). However, preschoolers have difficulty articulating an adult-like conception of attentional focus (e.g., Flavell et al., 1995, Flavell, Green, Flavell, & Grossman, 1997). As such, children’s understanding of the role of attention in learning might lag behind that of desire. Finally, there is some understanding of intentionality at very early ages (e.g., Woodward, 1998). However, understanding that intentions and desires are distinct and that intended actions can produce desired results by accident occurs after children come to understand that intentional actions
are epistemic (i.e., that people intentionally act because they believe their actions will have particular results; see e.g., Feinfeld, Lee, Flavell, Green, & Flavell, 1999; Phillips, Baron-Cohen, & Rutter, 1998; Schult, 2002; for a review, see also Moses, 2001).

To test these hypotheses, Sobel et al. (2007) first performed a CHILDES analysis, examining five corpora of parent-child interactions. They isolated children’s spontaneous usage of the words *learn* and *teach*, and analogs based on those roots (e.g., *learning*). They found that as children got older, their utterances were more likely to indicate an understanding of how learning was taking place. Talk about the role desire played in learning decreased with age, while talk about the role attention played remained stable (children rarely talked about intentionality). These natural language data suggest that as children grow, they begin to understand learning in terms of other mental states in addition to desire.

The utterances they analyzed were a small sample, and the fact that children did not talk about learning much does not indicate that they lack an understanding of the learning process. In follow-up procedures, Sobel et al. (2007) investigated 4- and 6-year-olds’ understanding of whether characters learned information based on conflicts between various mental states. Children were told explicitly about two mental states of a character that were either consistent or inconsistent with each other. For example, a consistent story might be that the character wanted to learn something and attended to the relevant information, while an inconsistent story might be that the character wanted to learn, but failed to attend. They found that both age groups correctly judged whether learning would occur in the consistent cases, but justified their responses differently. Four-year-olds justified responses in terms of desires (even when desire was not mentioned). Six-year-olds were more likely to justify their responses in terms of attention and intentionality of the characters.

More interesting are the responses on the inconsistent stories. Four-year-olds’ responses were desire-based—they judged that learning occurred if the character wanted to learn, regardless of the character’s other mental states. Six-year-olds were more likely to judge that characters who lacked the intention to learn or who failed to attend to information would not learn, even if they wanted to learn. There was also evidence that the older children began to appreciate that learning could be incidental—6-year-olds were more likely than 4-year-olds to say that a character who attended to information would learn it, even if she did not practice.

Taken together, these data suggest that children’s explicit judgments of whether learning occurs follow a developmental pathway that parallels their understanding of belief. Children potentially start as “desire psychologists” (Gopnik & Wellman, 1994; Wellman, 1990) and appreciate the role of perceptual access (e.g., Wellman et al., 2001) and then intentionality later in
development (e.g., Schult, 2002). Children might similarly be desire-based about whether learning occurs and come to appreciate the roles these other mental states play as they move into the elementary school years.

**CHILDREN’S DEVELOPING CONCEPTS OF TEACHING**

Learning and teaching are often complementary activities that occur in relation to each other (LeBlanc & Bearison, 2004; Strauss & Shilony, 1994). One person teaches and the other learns in a joint interaction. However, this relation does not mean that exactly the same mental states and skills are involved for both. For example, learning can either be intentional, when we set out to acquire new knowledge or skills, or incidental, when we find out something new that we did not expect to know. Teaching, arguably, can only be intentional. We have specialized terms to distinguish instances when we learn something from someone without their help (e.g., observational learning, incidental learning, or imitation).

Teaching can be defined as an intentional activity to increase someone’s knowledge or skills (Frye & Ziv, 2005; Kruger & Tomasello, 1996). Given that there is a goal to teaching, it is possible to recognize an activity as teaching, even if it is unsuccessful. Describing teaching as intentional also makes it possible to separate it from imitation, in which someone learns from another but the other might not have the goal to teach (Premack & Premack, 1996). Olson and Bruner (1996) were among the first to apply a theory of mind approach to teaching (see also Strauss, 1993; Strauss & Shilony, 1994) and reasoned that instruction depends on a perceived knowledge difference between teacher and student. They point out that when there is “no attribution of ignorance [then there is] no effort to teach” (p. 12). Recognizing the lack of knowledge or possession of mistaken information makes it possible to adopt a goal to change that state through a chosen activity.

This mental state definition of teaching suggests that young children will need theory of mind abilities before they can recognize teaching and distinguish it from other means of acquiring knowledge. Specifically, children will need to be able to appreciate when people lack knowledge or are ignorant (Hogrefe et al., 1986) and when they have mistaken beliefs (Wimmer & Perner, 1983). They will also have to begin to identify when people are acting intentionally (Astington, 1991; Baird & Moses, 2001; Feinfeld et al., 1999; Moses, 2001; Schult, 2002). These developments are accomplished during the preschool and entry-to-school period. Their timing indicates that the understanding of teaching should be accomplished near the start of formal schooling.

Perhaps the first systematic investigation of teaching (although not described as such) comes from Piaget (1926), who compared children’s
spontaneous language utterances with those of other children and adults. He found that the majority of the utterances generated by two 6.5-year-olds he observed were egocentric. In further observations of children interacting, he outlines stages of communication, ranging from purely egocentric, in which children at age 4 have roughly two distinct monologues, to a stage in which they can dialogue about collaborative action (at roughly age 5.5), and then finally dialogue about action or events not directly present (at roughly age 7). It is interesting that these latter stages are often evidence of teaching in young children. For instance (taken as evidence of children in the second stage):

Rog (5;6) asks Ez (6;4) to explain a point in an education game: “Was there one of these ones with the yellow ones?”

Jac (7;2): You musn’t show him.

Ez: There are yellow ones. He’s doing it all wrong. That one’s much easier. You can finish it now. Go along and finish it. (Piaget, 1926, p. 61)

We do not necessarily endorse Piaget’s ideas about communication at age 4 being completely egocentric, and suggest, like many others, that younger children might have fairly advanced perspective-taking abilities both in their natural language (e.g., Bartsch & Wellman, 1995; Shatz et al., 1983) and cognition (e.g., Miller, 2000; Wellman et al., 2001). What is interesting about this exchange (and many of these examples) is that the communication describes a clear act of teaching. One child (Rog) asks for information from another child. The other child (Ez) provides that information (with the third child, Jac, more metacognitively saying that Ez should not). Such spontaneous instances of teaching are potentially commonplace for these older children. An open question is when such teaching acts emerge in children’s communication, and when children recognize acts as teaching.

**Identifying Teaching**

We will first examine when young children recognize that teaching is taking place. Ziv and Frye (2004) presented preschoolers with short scenarios based on the mental-state components of teaching. They were told simple stories in which characters differed in their knowledge of how to do something (e.g., read) and then were asked to predict whether one character would try to teach the other. Both 3.5- and 5.5-year-olds were able to answer these questions correctly. They were able to say that the person who has knowledge about something would teach the other who did not (i.e., “Who should be taught?” and “Who can teach?” stories). Children were even able
to make this judgment when the person who possessed the knowledge was a child and the person who lacked it was an adult teacher (“Can a teacher be taught?”). This pattern of results indicates that 3.5-year-olds use knowledge conditions to interpret teaching and do so despite the usual role of the character. It also confirms Olson and Bruner’s (1996) prediction that young children appreciate that a lack of knowledge is necessary for teaching to occur.

Ziv et al. (2008) used a similar approach to see if 3.5- and 5.5-year-olds realized that intention was a defining feature of teaching. They presented children with stories that contrasted teaching with imitation, thus removing the intention to teach from the story. For instance, children heard about a character (A), who learned from watching another person (B), who was unaware that A was watching. Three-and-a-half-year-olds judged that B was teaching, while 5.5-years-olds recognized that B was not teaching.

Children were also given an example of guided discovery learning in which a teacher was trying to teach but presented the activity as if it were a game (Embedded teaching). Here, the younger children thought that the teacher only wanted to play, but the older group began to acknowledge that the adult’s goal was to teach. The results of these stories indicated that only the 5.5-year-olds used intention to distinguish teaching from learning in situations like imitation and guided discovery.

Finally, Ziv et al. (2008) investigated whether children appreciate the role belief has in guiding instructors’ actions. The actual knowledge states of the learners do not determine teaching, but the perception of those knowledge states do. For example, what if a teacher were to have a false belief about a student’s knowledge, as might occur when someone underestimates the level of understanding of a new class or particular student? If this situation is judged on the actual knowledge states involved, no teaching would be predicted, but if the teacher’s perspective is relevant, there will be an attempt to teach. Ziv et al. presented 3.5- and 5.5-year-olds with stories in which teachers had a variety of inaccurate beliefs. In these stories, the teacher either assumed the student did not know, when he actually did (Underestimate learner); or assumed he knew, when he did not (Overestimate learner); or assumed that his own knowledge was correct, when it was not (Overestimate self). Only the 5.5-year-olds were able to predict teaching on the basis of the teacher’s point of view, and this understanding was correlated with success on a standard unexpected-transfer false-belief task (Wimmer & Perner, 1983). Thus, the more complicated knowledge conditions again reveal a developmental advantage for 5.5-year-olds in being able to understand what teaching is and when it will occur.

The difference between younger and older preschoolers’ understanding of the mental state components of teaching has direct implications for their concept of teaching and may affect how they recognize it in everyday...
situations. For example, teaching and imitation are both specific means of knowledge acquisition with unique characteristics. The current results, however, indicate that only older preschoolers distinguish between the two. The distinction is important because understanding the difference is necessary for having different expectations in the two situations. In real instances that correspond to the stories presented here, young preschoolers might expect an adult’s level of involvement in a student’s learning to be the same whether the adult was teaching or just being observed doing something.

Moreover, some of the data on children’s understanding of the learning process integrate well with these results. In both cases, children have to separate beliefs from reality, suggesting that what children know about how beliefs are formed, represented, and change informs their understanding of both learning and teaching. That said, the inferences children have to make are slightly different. In the cases in which children have to distinguish between claims or false beliefs about learning and the reality of evidence for learning, children have to ignore the claim and focus on the reality. In the cases of judging teaching, children have to use the false belief of the teacher while ignoring the reality of the knowledge states.

**Children’s Teaching**

One activity in which it must be expected that children’s conception of teaching would make a difference is in their own teaching. It is not unusual for school-aged children to be given the opportunity to engage in peer teaching (e.g., Flynn, 2010; Rogoff, 1990) or reciprocal instruction (e.g., Brown & Palincsar, 1989). If young children are just developing a conception of teaching, it is likely to make an observable difference in how they approach the activity. Arguably, intention links the understanding and conduct of teaching. Because teaching is an intentional activity, you have to understand what it is in order to be able to do it.

Consequently, placing young children in a situation in which they have an opportunity to teach could be a good test of their understanding of teaching. In order to recognize whom they should teach, children must realize that a potential student lacks skill or knowledge, and they must intentionally choose a strategy to do something about it. Wood, Wood, Ainsworth, and O’Malley (1995) examined children’s teaching by studying pairs of 3-, 5-, and 7-year-olds in which one child knew how to construct a block pattern because they had previously been taught by an adult and the other did not. The oldest children displayed the most success in teaching by using verbal instructions and contingent instruction in which they adjusted the amount of help they gave depending on the learner’s current success.
Similarly, Ashley and Tomasello (1998) tested pairs of toddlers from 2 to 3.5 years of age in which they had to act cooperatively to operate a simple device. Then each child was given the opportunity to teach a new child what to do. Only the 3.5-year-olds appeared to teach in this situation. They coordinated their actions more with the new child, gave specific directives for what the other child should do, and produced some demonstrations to illustrate what should be done.

Children’s teaching also appears related to their emerging theory of mind abilities (Astington & Pelletier, 1996; Strauss et al., 2002). For instance, Strauss et al. (2002) asked 3.5- and 5.5-year-olds to teach a peer a simple board game. They found that the younger children were more likely to demonstrate the moves in the game and the older children were more likely to explain them, and the number of explanations was related to children’s success on standard false-belief measures. Davis-Unger and Carlson (2008) performed a more detailed investigation of the task and introduced instances in which an adult learner made (deliberate) errors. They found that over the preschool ages, children increased the time, rules presented, and strategies used in teaching and that all of these differences were related to theory of mind performance. Five-and-a-half-year-olds were also much better at noticing a learner’s errors and responding with a variety of strategies. Recently, Howe, Recchia, Della Porta, and Funamoto (2012) found similar patterns for sibling pairs, with older siblings being better at adjusting their strategies to teaching two different types of tasks.

The pattern of results across these studies is generally supportive of the idea that children develop an understanding of teaching during the preschool period. Their efforts to engage in teaching seem to begin at 3.5 years and continue to change thereafter. There is evidence that this understanding is related to standard theory of mind developments. It will be interesting if more specific relations can be established between children’s understanding of what is needed in a teaching situation and what strategies they start to employ. For example, when children are trying to bring about a particular outcome in their teaching, do they become more aware of deviations from that outcome and more motivated to correct them? Similarly, as we suggested above regarding learning, children who develop the ability to integrate mental states together to recognize that beliefs are not fixed should also be able to make deeper inferences about the roles different mental states play in their own teaching.

**Children’s Learning From Teaching**

Several studies have recently suggested that, at very early ages, children make pedagogical inferences from others’ teaching (e.g., Bonawitz et al.,
2011; Gweon, Pelton, & Schulz, 2011) based on their natural ability to read the intentions of others during communication (what Csibra & Gergeley, 2009 call “natural pedagogy”). These studies, however, categorize teaching as an act of communication, subject to children reading the intentionality of their interlocutor, that is, whether their actions are goal-directed. We have suggested that children’s understanding of the epistemic aspect of intentionality is also critical to their understanding of learning and teaching. Studies on pedagogy do not examine how the child’s own knowledge of teaching affects whether they understand why another would teach. That is, does understanding what teaching is—an activity to change what others know—help children to participate in attending to it?

There is surprisingly little research on this question. Woodburn (2008) made a first step in considering this question in a 1-year longitudinal study of the transition from Head Start to kindergarten. Some 120 Head Start and kindergarten participants (ages 3.3 to 6.8) were assessed on
(a) an understanding-of-teaching scale constructed from the previously described teaching stories (Ziv & Frye, 2004; Ziv et al., 2008), (b) the Wellman and Liu (2004) theory-of-mind scale, (c) the Learning Behavior Scales (McDermott, 1999; McDermott, Green, Francis, & Stott, 1999), (d) Adjustment Scales for Preschool Intervention (Noone-Lutz, Fantuzzo, & McDermott, 2002), and (e) standardized measures of literacy (Test of Early Reading Ability—TERA) (Reid, Hresko, & Hamil, 2001) and early mathematics (a short form of Ginsburg & Baroody’s [2003] Test of Early Math Ability—TEMA).

As would be expected with children of these ages, there was improved performance on each of the measures over the course of the year. Rasch modeling indicated that a 5-item subset of the understanding-of-teaching stories could be treated as a scale. Simultaneous multiple regression analyses using the literacy scores at time two as outcomes indicated that all of the independent variables at time two (age, understanding of teaching, theory of mind, learning behavior scale) were related to the literacy outcome. When the predictive relation between the independent variables at time one and the literacy outcome at time two was tested, only initial literacy and understanding of teaching scores remained in the equation. These findings indicate that the children who started with better literacy skills and the ones who had the better understanding of teaching were the ones who benefitted the most from the literacy instruction that was presented during the first year of school. This finding suggests that knowing what it means to teach does benefit children’s ability to learn from teachers.
Summary

We have suggested that children’s developing social cognition influences how they teach, how they understand teaching, and how they learn from teachers. Our general conclusion is that two basic aspects of social-cognitive development greatly influence these processes: how children understand the ways in which beliefs are formed and change, and their ability to integrate mental states together to recognize that beliefs are not fixed and depend on other mental states. Children’s understanding of teaching, like their understanding of learning, relies on their developing knowledge of others’ mental states.

LEARNING AND TEACHING IN CHILDREN WITH AUTISM SPECTRUM DISORDER

Given that children’s developing understanding of belief and its relation and integration with other mental states (such as intention) plays a primary role in their understanding of the concepts of learning and teaching, what happens to children’s understanding of learning and teaching when their understanding of beliefs and intention is impaired? Autism Spectrum Disorder (ASD) is a prominent developmental disorder that is found in about 1% of the US population (CDC, 2006). It is known to affect the ontogenesis of metacognitive abilities, such as the understanding of belief and intention in others. ASD manifests in the first 3 years of life and is characterized by impairments in social skills, verbal and nonverbal communication, and by the presence of restricted interests, behaviors, and activities (American Psychiatric Association, 2000). One dominant psychological hypothesis that explains these diminished social and communicative characteristics is that children with ASD have an impaired theory of mind (e.g., Baron-Cohen, 1989; Frith, 1989; Leslie, 1987). Does a diminished capacity for mental-state understanding in children with ASD affect these children’s understanding of the processes of learning and teaching?

We have seen that typically developing (TD) children’s understanding of the processes of learning and teaching relates to their developing theory of mind. For instance, an understanding of others’ intentions is critical for understanding aspects of the learning process (Sobel et al., 2007), and recognizing that teaching is an activity that is performed on purpose (Ziv et al., 2008) is critical for understanding aspects of the teaching process. Children who have difficulty understanding differences in knowledge states between two agents may be limited in their ability to appreciate the role that changing beliefs might have in learning, or to see the reason for someone to teach another. Similarly, if children have trouble understanding when
others act intentionally, then they are likely to struggle with understanding the intentional components that underlie the processes of learning and teaching. Investigating the developing understanding of others’ beliefs and intentions in children with ASD may reveal what children who are autistic know about the processes of learning and teaching. Moreover, such investigations could inform us about the relation between children’s developing theory of mind and the understanding of learning and teaching.

Research investigating aspects of social-cognitive development in ASD has provided repeated demonstrations that “high functioning” children with ASD (HFA) have delays or deficits on mental-state attribution tasks compared with TD children matched for verbal mental, and chronological age (see Baron-Cohen, 1989). In particular, HFA children exhibit fundamental impairments or significant delays in understanding inaccurate knowledge or false belief in others (e.g., Baron-Cohen, Leslie, & Frith, 1985; Peterson, Wellman, & Liu, 2005; Senju et al., 2010). A meta-analysis of studies employing a variety of false-belief paradigms showed that children with ASD on average are not successful on false-belief tasks until they have an estimated verbal mental age (VMA) of at least 11 years (Happé, 1995). To date, there have been no reported cases of a group of children with ASD whose mental age is equivalent to typically developing preschoolers who pass standard false-belief tasks (Baron-Cohen, 1989; Lombardo & Baron-Cohen, 2010). Based on the extensive literature documenting an attenuated theory of mind and, in particular, impairments in false-belief understanding in HFA children, there is good reason to suspect that delays in the understanding of belief for children who are autistic might obstruct their ability to determine what actions constitute learning and teaching.

Belief understanding, however, is not the only element involved in understanding learning and teaching. Understanding others’ intentions is crucial to understanding core components of learning and teaching. As demonstrated in the previous sections, judgments of intentionality relate to both the understanding of learning and the understanding of teaching. For example, Ziv et al. (2008) asked preschoolers to judge the intent of an instructor’s action in an embedded teaching task. In this story, children had to determine whether a given action is brought about by one of two intentions (e.g., to play a game or to teach). Four-year-olds performed significantly worse than 5-year-olds, a finding consistent with Baird and Moses’s (2001, Study 1) “same action/different intention” task, in which children were required to judge whether the same action could be motivated by different intentions. Further, understanding the “successful imitation” task (Ziv et al., 2008) involves appreciating that a desired outcome (e.g., learning how to tie a knot) resulted from an unintentional action on the part of the teacher. Schult (2002) demonstrated that TD 4-year-olds struggled to understand cases in which a character’s desires were satisfied by an
unintended action (i.e., they interpreted such events by saying that the actions were intentional all along). Five-year-olds were more likely to appreciate that desires could be satisfied by unintentional actions.

What about HFA children? Are HFA children delayed in their understanding of intention and thus possibly delayed in understanding the relevance of intention to learning and teaching? Unlike false-belief understanding, relatively little research has examined the understanding of others’ intentionality in HFA children. Moreover, the work that has been done has resulted in discordant findings showing HFA children sometimes do and sometimes do not perform worse than matched controls on tasks that examine judgments of others’ intention-in-action (Russell & Hill, 2001; but see also Phillips et al., 1998; Williams & Happé, 2010). Studies that test judgments of nonverbal intention-in-action have also yielded mixed results (see Aldridge, Stone, Sweeney, & Bower, 2000; Carpenter, Pennington, & Rogers, 2001; Hornbeck, 2001; but also see Huang, Heyes, & Charman, 2002, 2006).

Despite these inconsistent observations about intention-in-action, it is clear that HFA children are delayed in understanding intentions-in-others. Two recent studies suggest that HFA children struggle with developing an appreciation of intentional versus unintentional behaviors in others (D’Entremont & Yazbek, 2007; Williams & Happé, 2010). However, to determine more fully whether HFA children understand intentions (in others), which then provides critical information about their understanding of the intentional aspects of learning and teaching, we need to investigate whether HFA children have an appreciation for the mental state itself, as has been done in studies with TD children.

Knutsen (2012) investigated HFA children’s (Mean CA: 7;9) understanding of the concept of teaching and intentions in others, as well as the relation between these two concepts. To examine the knowledge and intentional aspects of teaching, HFA children were presented with tasks similar to those used in Ziv and Frye (2004) and Ziv et al., (2008). To examine the distinction between intentions and desires and to examine the understanding that different intentions may be used to carry out the same action, HFA children were presented with tasks used by Schult (2002) and Baird and Moses (2001), respectively. The teaching measure was composed of (a) knowledge stories that included a simple knowledge task (e.g., Who should be taught?), a teacher’s misestimation of the learner’s knowledge tasks, and a teacher’s misestimation of own knowledge tasks; and (b) intention-in-teaching stories that included a successful (intentional) teaching task, a failed (intentional) teaching task, a successful (nonintentional by the teacher) imitation task, and two teaching-embedded-in-a-game (guided discovery learning and its control) tasks (Frye & Ziv, 2005). In the intention-desire distinction measure, children were presented with stories in which
the character’s intention or desire either was or was not satisfied (Schult, 2002); whereas the “same action/different intentions” measure had two characters performing an identical action motivated by substantially different desires and intentions (Baird & Moses, 2001).

In the teaching stories, Knutsen (2012) found HFA children to be impaired in understanding the knowledge-state component that underlies teaching. The HFA children responded above chance, although were significantly worse than the TD 3- and 4-year-olds in the original sample (Ziv & Frye, 2004) on the simple knowledge task (“Who should be taught?”). They were also significantly worse on the two intention stories in which the teacher’s attempt to teach either resulted in the student learning or not (the successful teaching; failed teaching condition from Ziv et al., 2008). HFA participants also performed at or below chance and were significantly worse than the original sample of TD 5- and 6-year-olds (Ziv & Frye, 2004) on all of the knowledge teaching stories in which a character misestimated the knowledge state either of the other or of him/herself. Finally, HFA children struggled at tasks that involved a teacher having a false belief about either their own knowledge state or the knowledge state of the learner. For instance, when a teacher thought that their student already knows how to spell his/her name, when in fact the student does not, HFA children claimed that the teacher would still try to teach the student how to spell his/her name.

These preliminary findings suggest that HFA children’s understanding of teaching and learning is constrained by their impaired understanding of teaching as an intentional activity that requires appreciating that there is a knowledge difference between two people. HFA children’s metacognitive delays in the understanding of beliefs and intentions in others impedes their ability to understand these two mental-state components that underlie the teaching process. HFA children’s understanding of the teaching aspects of the learning process (e.g., when learning occurs or not, based on whether the attempt to teach occurred) is also potentially compromised by their delays in mental-state understanding.

These findings provide a roadmap for conducting further research on young typically and atypically developing children’s understanding of the processes of teaching and learning as well as how such abilities relate to their mental-state understanding. For instance, a next step might be to investigate HFA children’s understanding of their own intention and its relation to their understanding of the processes of learning and teaching. The results also imply that HFA children can be expected to struggle with activities in the classroom that require understanding beliefs and intention in others, such as following a teacher’s presentation that is being performed on purpose to impart knowledge to the student. Additional research should be conducted to explore HFA children’s reactions in the classroom to
teaching and learning situations by manipulating additional mental-state attributes used in particular teaching situations, such as the epistemic component of teaching and learning.

CONCLUDING THOUGHTS

The question of when and how young children understand the processes of learning and teaching has more than theoretical consequences. School readiness is often evaluated in terms of young children’s first grasp of literacy, numeracy, and social skills (e.g., Boyer, 1991; Mashburn & Pianta, 2006). Besides this focus on the different content areas of instruction, however, another important factor might be the understanding of instruction itself. Are children likely to show the most benefit from school if they do not yet grasp what teaching is? The same issue is important in preschool. The general question of whether students should be exposed to direct instruction (e.g., Klahr & Nigam, 2004) or guided discovery learning (e.g., Mayer, 2004) is long-standing (e.g., Anastasiow, Sibley, Leonhardt, & Borich, 1970), but it may have the most purchase in preschool. Because guided discovery learning does not require the understanding that instruction is taking place, there may be good grounds for employing it in preschool if young children do not yet know what teaching is. The answers to these questions about appropriate practice with children at the beginning of school might be advanced if it were possible to determine what they understood about teaching.

Further, what young children know about learning and teaching potentially relates to how they are engaged by and feel about the process of learning and being taught. These questions are particularly important given research on elementary school children, which suggests that how children understand the learning process potentially influences their later conceptions of knowledge, school, or themselves (Dweck, 1999; Dweck & Leggitt, 1988; Eccles, Wigfield, & Schiefele, 1998; Li, 2004; Skinner, 1995; Stipek & Mac Iver, 1989). What young children know about learning might initially shape how engaged they are by learning as well as their developing concepts of their own or others’ intellectual ability or drive. If children’s academic engagement is influenced by their understanding of learning and teaching, then one might also conceptualize early interventions that foster understanding of these processes.

Given these ideas, and given that children’s understanding of learning and teaching appears connected with their social-cognitive development, a critical question is how children’s understanding of the learning and teaching processes relate to their broader beliefs about school and their school readiness. For instance, understanding the extent to which the process of
learning involves integrating various mental states might relate to Dweck and Leggett’s (1988) “implicit theories” of intelligence as fixed or malleable constructs. The more the child recognizes that learning involves integrating various mental states, the more the child could conceptualize one’s learning ability as malleable (particularly if the child recognizes those mental states can change). Similarly, while children clearly learn much from guided discovery, the more children understand what they can learn from teaching, the more value they get from approaches to teaching that potentially emphasize direct instruction. Finally, interventions for HFA children that focus on social-cognitive development might affect how these children conceptualize learning and teaching, and particularly if those interventions focus on applying what children have learned to their daily lives, and more generally may improve how they learn from others. Such interventions could have broad application in the classroom, where now ~1% of the population is diagnosed with ASD. All of these hypotheses require future study and would have great relevance to and importance for how to translate basic research in social-cognitive development to the classroom.

REFERENCES


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