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Information about informants' knowledge states affects children's predictions of learning and their actual learning

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ABSTRACT

The current study investigated how young children understand social situations with others as learning contexts, and how they actually learn from them given informants' knowledge state and teaching intention. Study 1 found preschoolers' prediction of learning is influenced by the informant's knowledge state, and there is an age-related increase in expectation of learning from another and sensitivity to an informant's knowledge state and teaching intention. Study 2 confirmed that children's perception of an informant's knowledge state affects how much information they themselves accept from the social situation. Overall the findings showed that children's evaluation of a social situation as a learning context varies based on the informant's knowledge state, which is applied to their actual learning.

1. Introduction

Young children learn about the world from many social situations with others. Even though children's own perceptual observations and firsthand experiences make fundamental contributions to the construction of knowledge (Bruner, 1973; Piaget, 1970; Wellman & Gelman, 1998), other people also play important roles as informants or guides in their learning. An important feature of this social learning is that it is selective (Heyes, 2017; Sobel & Kushnir, 2013). Young children give more attention to and acquire knowledge from particular informants and interactions as the extensive research on testimony demonstrates (Mills, 2013). Although selective learning may begin in infancy (Poulin-Dubois & Brosseau-Liard, 2016), it is common during the preschool period and may become more discriminating over this period, either through a process of rational inference (Sobel & Kushnir, 2013) or by being guided by conceptual changes (Sabbagh, Koenig, & Kuhlmeier, 2017)

One change that may be compatible with both the rational inference and conceptual development approaches is in children's understanding of learning itself. A basic definition of learning is that it requires a change in knowledge or skill (Knutsen, Frye, & Sobel, 2014; Wang, 2010). If there is no change in knowledge or skill, then learning has not occurred. While most research on young children's understanding of learning has not focused on whether children employ this concept, Wang (2010) found that 5- and 6-year-olds, but not 4-year-olds, judged when learning occurred based on the presence of a change in knowledge. Only older preschoolers understood that even if a teacher teaches something, if a person already knew it, then it cannot be said the person learned it now. These results indicate that in early childhood children gain an understanding that learning is dependent on whether a change in knowledge occurs.

If children reach this understanding of learning during preschool, then this conceptual change may affect their learning itself and

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allow it to be more selective. Children learn from infancy onwards, but they may become aware of learning through its connection to changes in knowledge. Understanding that learning depends on changes in knowledge could let them detect when they have learned and also allow them to pay more attention to the circumstances that make a change in their knowledge possible. On this view, one way learning becomes more selective is because preschoolers come to understand what learning is and that understanding guides them to focus on the interactions that produce changes in knowledge that result in learning.

There is a body of theory of mind research (Astington & Pelletier, 1996; Esbensen, Taylor, & Stoess, 1997; Gopnik & Graf, 1988; O'Neill & Gopnik, 1991; Taylor, Esbensen, & Bennett, 1994; Wimmer, Hogrefe, & Sodian, 1988) that has found that changes in young children's judgments of learning correspond to their understanding of changes in knowledge. For example, when young preschoolers are asked when they learned something, they often do not acknowledge the change in their own knowledge and claim they have always known recently learned information, whereas 5-year-olds are able to recall when they learned something new (Taylor et al., 1994). In addition, 3-year-olds typically have difficulty identifying how they came to know a piece of recently learned knowledge (e.g., observed or were told the information), even though they can say what they had learned. In contrast, 5-year-olds can correctly identify not only what they have learned, but also how they came to know it (Gopnik & Graf, 1988; O'Neill & Gopnik, 1991).

The increased attention to knowledge and its relation to learning may also identify changes in how preschoolers evaluate social situations for learning and select appropriate information from them. The research on testimony has established preschoolers explicitly begin to choose accurate informants over less reliable ones by 3 years (Birch, Vauthier, & Bloom, 2008; Clément, Koenig, & Harris, 2004; Koenig & Harris, 2005; Pasquini, Corriveau, Koenig, & Harris, 2007). However, slightly later learning from testimony is related to the development of theory of mind (DiYanni, Nini, Rheel, & Livelli, 2012; Fusaro & Harris, 2008). It has also been found that information about informants' knowledge states influences how much preschoolers accept information from them (Sabbagh & Baldwin, 2001; Sabbagh & Shafman, 2009) and that in a new situation older preschoolers are more likely to accept testimony from someone who did not have access to knowledge before compared to someone who had access but was unreliable (Robinson & Nummoo, 2009).

These findings indicate that changes in children's conceptual knowledge can affect the selectivity of their learning. They suggest that changes in children's mental state reasoning or theory of mind may be one of the changes that affect preschoolers' learning by making them more aware of which situations can contribute to increases in knowledge. If this approach is correct, then there might be a developmental change in preschoolers' judgments of learning situations related to the development of theory of mind. For instance, Sabbagh and Baldwin (2001) found that preschoolers' own word learning was sensitive to whether informants stated they had knowledge or not of the word. To test whether children's selective learning relies on their judgments about the informant's knowledge and its relation to learning, preschoolers could explicitly be asked about their judgments of learning in these conditions. In other words, in order to understand why children choose or learn more from informants who claim better knowledge, and whether the reason is related to their conceptual development about learning, we may need to ask children to judge the situations as venues that can increase their knowledge. By having preschoolers evaluate prospective learning contexts based on informants' knowledge states, it may be possible to understand how young children's conceptualize these situations and how that is related to their social learning.

Moreover, just judging whether an informant is knowledgeable or not may not be the only selective factor in learning from a social situation. That is, knowing another's knowledge state may not be adequate to judge whether the person will be helpful or cooperative in increasing knowledge. A recent theoretical framework suggests that learners may judge presented information not only based on an informant's knowledge, but also based on the informant's intention (Landrum, Eaves, & Shafto, 2015; Shafto, Eaves, Navarro, & Perfors, 2012). For instance, some empirical studies have shown that young children more heavily weigh informants' niceness and honesty over their expertise or whether they accessed the property of a novel object (Landrum, Mills, & Johnston, 2013; Lane, Wellman, & Gelman, 2013; Mascaro & Sperber, 2009). These results could indicate that children's awareness of why others present information (e.g., is it helpful or deceptive?) may also affect their willingness to learn from them.

If it is the case that children consider the intention of others who present information, knowing another's teaching intention could be another factor that can influence children's learning from it. Recent research has shown that from infancy human beings are sensitive to other's pedagogical cues, such as generic language, eye contact, gaze shifting, pointing, and child-directed speech, to transmit information (Csibra & Gergely, 2009; Sage & Baldwin, 2011; Southgate, Chevallier, & Csibra, 2009). In addition, children generalize information more (Butler & Markman, 2012; Egyed, Király, & Gergely, 2013; Topál, Gergely, Miklósi, Erdőhegyi, & Csibra, 2008; Träuble & Bätz, 2014), imitate actions further (Gergely & Csibra, 2005; Southgate et al., 2009), and transmit novel functions of objects to other persons longer (Vredenburgh, Kushnir, & Casasola, 2015) when the target information is accompanied by adults' communicative and pedagogical cues.

Children's understanding of teaching situations continues to develop, so that roughly by 5 years they come to know explicitly that teaching involves a specific goal to inform others or have them gain knowledge (Ziv, Solomon, & Frye, 2008; Ziv, Solomon, Strauss, & Frye, 2016). Also, children who understand that teaching involves a goal to increase knowledge, skills or understanding of something, learn better when an informant reveals a specific goal of instruction like, "I will teach you X" (Jeong & Frye, 2018). That is, knowing another's specific intention to teach may allow children who understand the intentionality of teaching to pay attention to and cooperate with the specific goal of instruction.

Even though pedagogical cues (Butler & Markman, 2012; Csibra & Gergely, 2009; Sage & Baldwin, 2011) or specific teaching goals (Jeong & Frye, 2018) can increase learning, one relevant, but not addressed question is whether children differentially evaluate teaching and no teaching situations as *learning* contexts. For instance, in no teaching or no pedagogy situations, in which someone does not have an intention to teach, learning from the person could be more challenging, even if the person has adequate knowledge. The situations could be different from teaching because we literally do not know whether the person will be willing to help us learn or

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