

Another way to learn about teaching: What dogs can tell us about the evolution of pedagogy

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Abstract: Kline argues that it is crucial to isolate the respective roles of teaching and learning in order to understand how pedagogy has evolved. We argue that doing so requires testing species that learn from pedagogy but that rarely teach themselves. Here, we review how one previously neglected species – domesticated dogs (*Canis familiaris*) – may allow researchers to do just that.

In the target article, Kline argues that understanding the evolution of pedagogy hinges on isolating the respective roles of teaching and learning. Though we agree with Kline that this is an important distinction, we also see one challenge for this approach: Since humans are adept at both teaching and learning, it will be difficult to disentangle the roles of teaching and learning by focusing on our species alone. As the target article makes clear, a common framework for comparing teaching behavior across species will be crucial for understanding how various aspects of pedagogy evolved, and which characteristics of teaching are unique to humans. Here, we argue that building this common framework relies on the careful consideration of which species offer the most valuable insights into these evolutionary questions.

We believe that one species that has previously been neglected in research on teaching – domesticated dogs (*Canis familiaris*) – may hold the key to answering some of the target article's most pressing questions regarding the evolution of pedagogy. Given that domesticated dogs are sensitive to the same ostensive cues as human children (e.g., Hare 2005; Miklósi et al. 1998; Topál et al. 2014), dogs provide a unique opportunity to directly compare human learners to nonhuman learners while holding human teaching behavior constant. Like human children, dogs must learn from human teachers how to navigate a human environment that is complex both physically and socially. In human and dog pupils, ostensive communication serves to highlight these teaching episodes and to engage the learner. This shared ability to learn from ostensive communication allows us to directly compare children and dogs by designing studies in which a human teacher demonstrates information in the exact same way for both species (e.g., Topál et al. 2009). In doing this, we can explore which aspects of human learning are unique, and which aspects may evolve jointly with sensitivity to ostensive communication.

As Kline argues in the target article, one characteristic that makes humans truly unique is their ability to transmit knowledge across multiple generations. An obvious question that remains is whether there are particular aspects of human teaching or human learning that underlie this uniquely human trait. One possibility is that humans have a unique set of expectations about communication that allow them to learn from others in a

particularly efficient way. Although dogs share a general sensitivity to ostensive cues, humans may have additional expectations about information when it is provided ostensively. Supporting this idea, human children seem to expect that ostensive communication will be relevant (e.g., Lyons et al. 2007), truthful (e.g., Jaswal et al. 2010), sufficient (e.g., Bonawitz et al. 2011), and generic (e.g., Csibra & Gergely 2011). While it is possible that these expectations are unique to humans, it is also possible that dogs share some of these expectations about ostensive communication. By carefully examining the extent to which these expectations overlap in humans and dogs, we can begin to understand the selective pressures that have shaped the psychology of learners in our own and other species.

Another advantage of studying teaching in dogs is that we are able to experimentally compare dogs' performance with that of humans, and thus carefully isolate the roles of teaching and learning. Although ethograms and naturalistic observation have the potential to provide a wealth of information as Kline suggests, we argue that a more productive way to link these fields will be to use parallel experimental methods when possible (for a similar argument, see Skerry et al. 2013). Even in cases where a species appears to share little observable teaching behavior with humans, there may be core similarities that can only be revealed through direct empirical comparison. If one simply observed con-specific teaching behavior in dogs, it would be easy to miss core similarities between dog learners and human learners. In contrast, by designing carefully controlled experiments with human demonstrators, researchers can have a better chance of revealing any core similarities that another species might share with human learners. To investigate whether dogs have human-like expectations about ostensive communication, for example, we could test dogs experimentally in the same situations presented to human children.

In allowing us to address these questions, dogs also offer us an opportunity for even deeper exploration into the selection pressures that may have supported the evolution of pedagogy. A key advantage of studying dogs is that we know a great deal about the sorts of selection pressures that led to the development of different breeds. By examining fine-grained differences in the way dogs interpret ostensive communication across breeds, we can learn quite a bit about the potential selection pressures that shaped the evolution of pedagogy. If some dog breeds are more similar to humans than others, we may gain insight into the kinds of evolutionary pressures that shape human-like learning skills. Likewise, comparing dogs to their social canid relatives – such as wolves and dingoes – allows for a more general understanding of which aspects of teaching may be widely shared by cooperative social species, and which are unique to domestication.

Empirically comparing teaching and learning separately across species will allow us to address some of the most crucial points Kline makes in the target article. Not only will this enable us to isolate the roles of teaching and learning, but it will also allow us to begin to understand the relative uniqueness of humans as teachers and humans as learners. Dogs are an ideal species for addressing these questions, since they are sensitive to the same ostensive cues as human children, and offer an opportunity for both cross-breed comparison and cross-species comparison with other social canids. This breadth of comparison has the potential to allow us to paint a particularly rich picture of how pedagogy may have evolved in humans and across species.