



Figure 1 (Rogoff). The facets defining Learning by Observing and Pitching In: a cultural tradition for fostering learning that integrates community processes with individual and group processes.

learning decades ago, I have written about the role of community arrangements and practices in facilitating learning, and the mutually constituting nature of teaching and learning (e.g., Rogoff 1990; 2003). Over more than a decade, I have published articles articulating a way of learning that appears to be common in Indigenous-heritage communities of the Americas.

This way of facilitating learning emphasizes the community's role. It is the central feature of the seven features that define this cultural tradition for fostering learning. In addition, all the facets of this learning tradition include complementary teaching/learning roles (Rogoff 2014). Figure 1 shows a prism defining the facets/features of Learning by Observing and Pitching In (LOPI). The prism's seven facets can be seen as broader versions of Kline's 5 teaching types; in addition, they form part of a cultural tradition for fostering learning that involves individual, interpersonal, and community processes.

Kline's laudatory aim to integrate developmental, cultural, and ethological studies of teaching would benefit from a more in-depth cultural view of the integrated manner in which individuals, small groups, and communities foster the learning of the next generation.

### The active role played by human learners is key to understanding the efficacy of teaching in humans

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**Abstract:** The early developing capacity of human learners to seek out reliable informants, initiate pedagogical episodes, and monitor and

redirect ongoing instruction is critical to understanding humans' remarkable capacity for cumulative culture.

Kline categorizes teaching types according to their ability to address different social learning problems. However, the learning problems that she identifies all assume an attentive teacher. Absent from her discussion are situations in which the learner must direct the attention of the teacher in order to obtain relevant information. We argue that the early developing capacity of human learners to seek out reliable informants, initiate pedagogical episodes, and monitor and redirect ongoing instruction is critical to understanding humans' remarkable capacity for cumulative culture.

In order for instruction to be effective, it must be relevant: its content must be novel and useful and/or connected to the learner's prior knowledge (Sperber & Wilson 1995). From the learners' perspective, one way to ensure that instruction is relevant is to select informants who are likely to be reliable. Recent research has shown that preschoolers are astute social learners who do not simply trust what they are told but selectively learn from informants (Harris 2012). Remarkably, even infants display selective learning capacities (Harris & Lane 2013). When presented with a novel toy in a laboratory setting, 12-month-old infants preferred to look at the experimenter for clarifying information rather than at their caregiver, even when the caregiver presented the novel toy (Stenberg 2009; see also, Stenberg 2013).

In addition to seeking out "local experts," infants actively recruit informants to obtain relevant information by redirecting the attention of their caregivers to personally relevant stimuli and by initiating pedagogical episodes through information requests. For example, 10- to 13-month-old infants are more likely to combine pointing with vocalizations when mothers are not paying attention, or fail to respond to the target of the point (Wu & Gros-Louis 2014), and 16-month-old infants are more likely to point to request information about novel objects when interacting with a knowledgeable experimenter rather than an ignorant experimenter (who had previously named familiar objects incorrectly and appeared unsure of the names of the novel objects) (Begus & Southgate 2012).

Preschoolers' language abilities give them additional tools to shape the instruction they receive. They frequently ask questions

(Chouinard 2007) and monitor informants' responses to their questions, often restating their questions or providing their own explanations when given unsatisfactory explanations (Frazier et al. 2009). Thus, young children not only initiate but also monitor and influence pedagogical exchanges.

Human learners' early developing capacity to initiate and influence pedagogical situations has a catalyzing effect on the effectiveness of the teaching behaviors identified by Kline, because it makes human teaching more responsive and relevant to individual learners. In turn, this increases the quality and quantity of information that can be exchanged through instruction. Therefore, it will be important for future research to not only study the occurrence of the teaching behaviors identified by Kline across and within species, but to also study the occurrence of learner behaviors that direct and redirect instruction.

In conclusion, the remarkable human capacity for cumulative culture seems attributable not only to the human capacity for teaching, but also to the active role played by human learners in the teaching process.

## More examples of chimpanzees teaching

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**Abstract:** Darwinism is a principle of biological continuity. This commentary argues against any claim of discontinuity between humans and other animals that must be based on absence of evidence. Instead, we offer additional examples of active teaching by chimpanzees.

Wisely, in our view, the only evidence for spontaneous teaching that Kline accepts is from professional records of field observations. Christophe Boesch, for example, is a veteran primatologist who has been publishing reports of wild chimpanzee behavior in respected scientific journals for more than 40 years. Boesch is best known for discovering that wild chimpanzees in Ta'i National Park, Ivory Coast, crack nuts by striking them with stones and branches that the chimpanzees specially select for use as hammers, and carefully place the nuts on rocks specially selected for use as anvils. In the course of intensive studies, he discovered that mothers of dependent infants engage in behavior much like teaching:

After successfully opening a nut, Sartre replaced it haphazardly on the anvil in order to attempt access to the second kernel. But before he pounded it, (his mother, Salome) took it in her hand, cleaned the anvil, and replaced the piece carefully in the correct position. Then, with Salome observing him, Sartre successfully opened it and ate the second kernel. Here, the mother demonstrated the correct positioning of the nut. (Boesch 1991, p. 531)

In a second example:

Ricci's daughter, 5-year-old Nina, tried to open nuts with the only available hammer, which was of an irregular shape. As she struggled unsuccessfully with this tool, alternately changing her posture, hammer grip, and the position of the nut, Ricci was resting. Eventually, after 8 min of this struggle, Ricci joined her and Nina immediately gave her the hammer. Then, with Nina sitting in front of her, Ricci, in a very deliberate manner, slowly rotated the hammer into the best position with which to pound the nut effectively. As if to emphasize the meaning of this movement, it took her a full minute to perform this simple rotation. With Nina watching her, she then proceeded to use the hammer to crack 10 nuts (of which Nina received six entire kernels and a portion

of the other four). Then Ricci left and Nina resumed cracking. Now, by adopting the same hammer grip as her mother, she succeeded in opening four nuts in 15 min. Although she still had difficulties and regularly changed her posture (18 times), she always maintained the hammer in the same position as did her mother. She whimpered whenever encountering difficulties, to attract her mother, but Ricci did not return to her even when she threw a temper-tantrum after unsuccessfully attempting to open a fifth nut for 3 min. (Boesch 1991, p. 532)

We are curious to see how Kline, or others, might apply her framework to the wild chimpanzees at Gombe featured in this Animal Planet video (available at: <http://www.animalplanet.com/tv-shows/jane-goodall/videos/almost-human-chimps-human-tools.htm>); or to Fouts et al.'s (1982) report of active teaching by the captive chimpanzee, Washoe. Washoe had begun to appropriately use signs of American Sign Language as an infant of about 10 or 11 months (Gardner & Gardner 1969). When Washoe was approximately 14 years old, Roger Fouts introduced Washoe to a 10-month-old infant chimpanzee, Loulis. During the first few days after Loulis arrived, Washoe often turned toward him signing COME, approaching him, and finally grasping his arm and drawing him close. During the next five days she signed COME and only approached without touching him. After about a week, Washoe only signed COME as she turned towards Loulis, and faced him until he came to her. Washoe also molded Loulis' hands to form signs. In one observation, as a human friend was bringing candy, Washoe repeated the FOOD sign, jiggling about and grunting with excitement. Loulis was watching her. Abruptly, Washoe stopped signing, molded Loulis' hand into a FOOD sign, and moved his molded hand to his lips. Washoe formed the GUM sign with her hands, but placed it on Loulis' cheek. She also formed DRINK with her own hand and brought it to Loulis' lips, and formed HAT with her own hands and brought it to Loulis' head. In still another observation, Washoe placed a small chair in front of Loulis and repeated the CHAIR sign while watching him intently.

Other examples of direct active teaching among nonhuman animals may be relatively rare because, as Kline points out, "there are simply more studies of human teaching – and a lower bar for 'establishing' teaching in humans – than for any other species" (sect. 7, para. 2). The framework in the target article promises to set common standards across cultures and species, thereby permitting comparative studies that might establish functional relationships between learning problems and teaching types. We wholeheartedly agree with this approach. If teaching is a product of biology, then it is a function of variables – a highly complex function, yes; many variables, doubtless; but a function of variables, nevertheless. Logical divisions between human and nonhuman and between teaching and nonteaching seem plausible only because divisions of this kind agree with Aristotle's law of the excluded middle.

Historically, philosophers claimed that humans were unique because only humans used tools, or later, because only humans made tools (e.g., Edman 1920, p. 15; Grzimek 1977, p. 357). Each claim was eventually discredited by observations. Perhaps, Kline's framework will stimulate more reports of direct active teaching by other animals. In the meantime, we are cautious about accepting still another claim for discontinuity between humans and other animals.

## The mutual relevance of teaching and cultural attraction

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