CHILD DEVELOPMENT

Child Development, May/June 2016, Volume 87, Number 3, Pages 643–653

Cultural Learning Redux

Michael Tomasello
Max Planck Institute for Evolutionary Anthropology

M. Tomasello, A. Kruger, and H. Ratner (1993) proposed a theory of cultural learning comprising imitative learning, instructed learning, and collaborative learning. Empirical and theoretical advances in the past 20 years suggest modifications to the theory; for example, children do not just imitate but overimitate in order to identify and affiliate with others in their cultural group, children learn from pedagogy not just episodic facts but the generic structure of their cultural worlds, and children collaboratively co-construct with those in their culture normative rules for doing things. In all, human children do not just culturally learn useful instrumental activities and information, they conform to the normative expectations of the cultural group and even contribute themselves to the creation of such normative expectations.

In contrast to their nearest great ape relatives, who all live in the general vicinity of the equator, humans have spread out all over the globe. To deal with everything from the Arctic to the tropics, humans have evolved a highly flexible suite of sociocognitive skills that enable them to create, in concert with others in their cultural groups, a variety of techniques for coping with whatever challenges may arise in their local environment, from building igloos to tracking large game. To take advantage of the group's accumulated knowledge and skills, developing children must possess species-unique skills of cultural learning.

Tomasello, Kruger, and Ratner (1993) proposed a theory of cultural learning. The main aim of the theory was to distinguish processes of cultural learning from processes of social learning more generally, many of which humans share with their nearest primate relatives. The broadest characterization was that whereas many primates can socially learn things *because of* or *from* another individual (e.g., where to find water, which fruits to eat), humans culturally learn things *through* another individual and her perspective on the situation (e.g., which strategy to use given a certain problem situation). Cultural learning thus depends on how the learner understands the individual from whom she is learning, for example, as an intentional agent who both pursues goals and attends to things relevant to those goals. Cultural learning, and only cultural learning, enables individuals to learn through one another in powerful enough ways to support the cumulative cultural evolution of human artifacts and practices over historical time (the so-called "ratchet effect").

For individuals who understand one another as intentional (or mental) agents, there can be three basic types of cultural learning. When the basic structure of the interaction is that the learner intends to learn something by observing an actor (who may not even know she is being observed), learning through that actor is imitative learning: learning to do what she intends to do. When the basic structure of the interaction is that someone intends to teach the learner, and the learner intends to learn through that instruction, we may speak of instructed learning: learning what she intends me to learn. And when two individuals are working together collaboratively and intend to learn through one another on a more equal footing we may speak of collaborative learning: We learn from each other's perspective on the situation. Figure 1 shows a very simple diagrammatic depiction of these three learning situations.

Much has changed in the 20+ years since this theory was first proposed. Most importantly, new empirical data have accumulated that force us to modify the theory in a number of specific ways. But in addition, several new theoretical proposals suggest that some basic reconceptualizations of the three processes are in order as well. Perhaps the most important overall consideration—as presaged already in Bruner's (1993) original commentary—is

Correspondence concerning this article should be addressed to Michael Tomasello, Max Planck Institute for Evolutionary Anthropology, Deutscher Platz 6, o4103, Leipzig, Germany. Electronic mail may be sent to tomas@eva.mpg.de.

 0009-3920/2016/8703-0002
DOI: 10.1111/cdev.12499

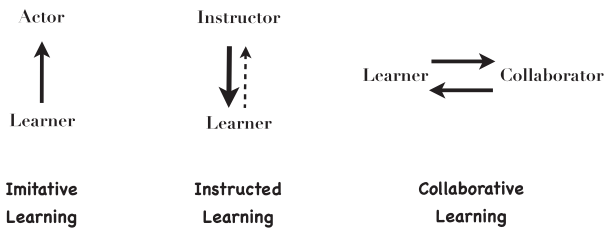

Figure 1. Diagrammatic depiction of three learning situations: imitative, instructed, and collaborator learning. Adapted from Tomasello, Kruger, and Ratner (1993).

that the theory does not do justice to the fact that human children are not just individuals attempting to learn more effective ways of doing things, but they are in addition individuals who are being pressed by the culture to learn and behave in normatively specified ways—and they have a tendency to conform to these normative expectations. In addition, although the most basic processes of cultural learning are characteristic of human beings in general, recent cross-cultural data have documented some differences in the way that children in different cultures learn from those around them. In the current article, our goal is to modify the original theory to meet these new data and theoretical challenges.

Imitative Learning

Observational learning is a very broad term that includes a variety of more specific processes. Tomasello et al. (1993) specified three ways in which young children may learn something from an actor observationally. First, they may simply *mimic* the bodily movements of the actor without attending to the goal of the action, for example, the way that human infants mimic the tongue protrusion of adults (Meltzoff & Moore, 1977). Second, they may observe some event in the environment caused by an actor's actions (e.g., the opening of a jar), and armed with this new knowledge (but with no attention to the actor's actions that caused the result), they may aim at the same result using their own behavioral strategies in acts of so-called *emulation learning* (Tennie, Call, & Tomasello, 2009). And third, putting together attention both to the actor's actions and to the goals she is trying to achieve, children may take the perspective of the other and engage in *imitative learning* of the intentional action as a whole.

Research in the past two decades has filled out this picture considerably. Three especially important lines of research support the original formulation of the cultural learning view. First, Meltzoff (1995) showed that 18-month-old children quite often respond to an actor's failed attempt to achieve a goal by reproducing not what the actor actually did but what the actor was trying to do (see Bellagamba & Tomasello, 1999, for the same result with 12-month-olds). Huang, Heyes, and Charman (2002), Huang and Charman (2005), and Huang, Heyes, and Charman (2006) found that some low-level attentional processes like object affordances and distraction may play a role in such cases, but the failed-attempts paradigm has also been used successfully with a number of different tasks that do not lend themselves to this alternative interpretation (e.g., see Carpenter, Call, & Tomasello, 2002; Tomasello & Carpenter, 2005), and it has even been used successfully in children's language learning (child learns verb for action adult was attempting unsuccessfully to perform; Akhtar & Tomasello, 1996, Study 2), where object affordances are not relevant at all. When infants are imitatively learning from others they are interpreting the instrumental act in terms of both its behavioral means and its intended goal.

Second, Carpenter, Nagell, and Tomasello (1998) showed that children of the same general age will selectively imitate an actor's intentional over her accidental actions. In this experiment, children saw an adult demonstrate several different action sequences, each of which had within it one intentional action and one accidental action (counterbalanced for order across children). They much more often reproduced the intentional than the accidental action (seldom reproducing both actions). And again there is a language learning experiment—children learn a verb for the action the adult performed intentionally not accidentally—with the same basic result (Tomasello & Barton, 1994, Study 3). These findings highlight once again children's focus on the intentional dimension of a demonstrator's actions.

And third, Gergely, Bekkering, and Király (2002) found that 14-month-old infants will reproduce an actor's intentional action, but only if it makes sense for them to do so. For example, when an actor uses an unusual means to turn on a light (with his head) because the more usual means is not available (his hands are occupied), then infants who have all means available will ignore the demonstration as not applicable to them (and use their hands), but they will follow the demonstration if the actor intentionally chose the unusual means when he had his hands available as well. The infants are

imitating "rationally" based on a means-ends analysis of both the actor's and their own action possibilities. Low-level interpretations have again been proposed for the rational imitation paradigm (based on "motor resonance"; e.g., Beisert et al., 2012; Klossek, Russell, & Dickinson, 2008; Paulus, Hunnius, Vissers, & Bekkering, 2011), but again only for the original task, whereas subsequent studies have used different tasks establishing the phenomenon much more robustly (e.g., see Buttelmann, Carpenter, Call, & Tomasello, 2007; Schwier, van Maanen, Carpenter, & Tomasello, 2006; Southgate, Johnson, Osborne, & Csibra, 2009). And there is a study of children's comprehension of an adult communicative act that follows this same logic without any possibility of "motor resonance" (child interprets adult's ambiguous request for an object as the one on a far table, not the one right in front of her, if her hands are free but not if they are occupied; Grosse, Moll, & Tomasello, 2010).

Clearly, then, in the months immediately following their first birthdays, the social learning of infants and toddlers is structured by their understanding of the instrumental actions of others in terms of both their means and goals. Two decades ago there was very little evidence that chimpanzees or any other nonhuman primates engage in this kind of imitative learning. Since then, it seems clear that great apes who have been raised by humans do engage in some forms of human-like imitative learning. Indeed, all three studies from the previous paragraph have been conducted with human-raised chimpanzees with generally positive results (the first two reported in Tomasello & Carpenter, 2005, and the third in Buttelmann et al., 2007). Concerning chimpanzees not raised by humans, the picture is not quite as clear, but the series of studies conducted by Whiten and colleagues (see Whiten, 2005, for a summary) suggests that their skills of social learning may be more human-like than was previously proposed as well. Still, in all studies in which great apes and human children have been directly compared, children's skills of imitative learning are quantitatively superior by several orders of magnitude (see, e.g., Herrmann, Call, Lloreda, Hare, & Tomasello, 2007).

In addition to these quantitatively powerful skills of imitative learning in instrumental contexts, recent research into young children's social learning has uncovered another dimension of the process that is very likely not shared with our nearest primate relatives at all: social imitation or conformity. The surprising fact is that young children do not just socially learn instrumentally useful actions, as documented earlier, they also copy others' actions more or less precisely in order to be more like them and to identify and affiliate with them. This has sometimes been called "social imitation" (Carpenter, 2006) to emphasize that the learner's motivation is not so much to learn new things as to display her group identity and affiliation.

For example, a consistent finding in comparative studies is that human children are much more concerned than are other great apes to copy the exact actions of others, including arbitrary gestures, conventions, and rituals (Tennie et al., 2009). Indeed, this tendency is so strong that some researchers have even coined the term *ritual stance* to capture the fact that when children do not see a clear goal to an actor's action, they imitate even more precisely than if they do see a goal (e.g., Herrmann, Legare, Harris, & Whitehouse, 2013; Watson-Jones, Legare, Whitehouse, & Clegg, 2014). Also tellingly, human children, but not great apes, copy even irrelevant parts of an action sequence in acts of so-called "overimitation" (Horner & Whiten, 2005; see also Lyons, Young, Frank, & Keil, 2007). And most tellingly of all, human children, but not great apes, conform to others even in situations when they have to override a previously successful strategy to do so, so-called "strong conformity" (Haun & Tomasello, 2011, 2014). There is one study suggesting that chimpanzees also conform even when they have an already effective method (Whiten, Horner, & de Waal, 2005), but closer inspection of the data shows that only one individual reliably switched its method of tool use to match that of others. Social imitation (including overimitation and the ritual stance) and strong conformity are not so much social learning strategies for increasing personal success in problem-solving situations, but rather they are mainly social strategies for aligning oneself with others so as to show one's affiliation and perhaps group identity with them (Over & Carpenter, 2013). A particularly interesting supportive finding in this regard is that human infants will selectively imitate individuals who speak their language, presumably in-group members, over individuals who speak a different language (Buttelmann, Zmyj, Daum, & Carpenter, 2013).

Interestingly, young children are so concerned with conformity that they will even enforce it on others, even when they themselves are not affected and the action involved is merely an arbitrary convention. For example, if children learn that on this table we play the game this way and on that table we play it another way, if a puppet then plays the

game the wrong way on the wrong table, they intervene and stop him (Rakoczy, Hamann, Warneken, & Tomasello, 2010; Rakoczy, Warneken, & Tomasello, 2008). In such interventions young children frequently use generic normative language such as "You can't do it like that!" or "That's the wrong way!" suggesting that nonconformity is somehow not compatible with our mutually known normative ideals of good conduct. Interestingly, when actors violate conventional norms, 3-year-olds admonish them more often if they are in-group rather than out-group members, presumably because in-group members should know better and be more committed to how "we" do it (Schmidt, Rakoczy, & Tomasello, 2011). The enforcement of conformity is so important for young children that 5-year-olds have more positive feelings toward a norm enforcer (even though he is acting aggressively) than they do toward someone who simply lets a norm violation go (even though he is behaving in a neutral manner; Vaish, Herrmann, Markmann, & Tomasello, 2016).

Although experimental evidence is sparse, by all indications humans in all cultures engage in imitative learning and normative conformity. What little experimental evidence we have for children suggests that it emerges at the same young age in infancy in all human cultures. Thus, Callaghan et al. (2011) found that in the most basic skills of imitative learning—using some of the same experimental paradigms cited in this section (e.g., failed-attempts)—1-year-old children growing up in three very different cultural settings (two small-scale, nonliterate) all manifest these skills at similar ages. Furthermore, Nielsen and Tomaselli (2010) found that children in a small-scale African culture "overimitate" in the same basic way as children from a larger industrialized culture, presumably for similar reasons. This all makes sense as the most basic skills of imitative learning are not imparted by culture (contra Heyes & Frith, 2014), but rather they make the evolution and acquisition of culture possible in the first place.

The overall point is that young children—and by all available evidence this is children in all cultures—are not just imitatively learning overt actions, but they are learning what others are intending to do. And they are not just learning actions that will be useful to them instrumentally, but they are imitating the precise actions of other individuals, even when these are irrelevant to the goal, in order to affiliate with others in the group. In general, young children are conforming to cultural conventions so as to fit in with the normative expectations of the group as a whole, and even making sure that others in the group follow convention as well by normatively enforcing conformity on them. Imitative learning thus reflects not only young children's need to acquire instrumentally useful information, but also the individual's strong tendency to conform to the normative expectations of their cultural group.

Instructed Learning

Among primates, only humans actively instruct their young (Thornton & Raihani, 2008). One way that human adults instruct is to "scaffold" children as they learn, for example, by simplifying the task and directing their attention to relevant task components. Tomasello et al. (1993) defined instructed learning as something more than such adult-scaffolded individual learning. Instructed learning, in their more narrow characterization, was when the child internalized adult instruction and used it subsequently to self-regulate her own behavior (e.g., telling herself to "find the corner piece" as she worked to solve a puzzle). To engage in instructed learning of this type—typically not until 4 years of age or so—the child had to take the adult's mental perspective as he attempted to affect her mental perspective. This was one of the first theoretical attempts to characterize instruction in terms of both what the child brought to the situation—the ability to comprehend mental perspectives—and what she took from it—the ability to internalize and use adult instruction to self-regulate her own problem-solving behavior.

A recent and very exciting theoretical advance in the understanding of instructed learning is the theory of natural pedagogy (Csibra & Gergely, 2009; Gergely & Csibra, 2006). This theoretical perspective has identified and characterized a form of instructed learning that goes beyond adult-scaffolded individual learning but still does not involve the internalization of instructions. The basic idea is that human children are evolutionarily prepared to be instructed by adults, and this plays a crucially important role in humans' unique processes of cumulative cultural evolution. This preparation comprises two novel social orientations.

First, children's preparation to be instructed is intimately tied to their preparation for the comprehension of cooperative communication more generally. Thus, a question that had long been overlooked was how children know when adults are instructing them rather than, for example, just

communicating with them about specific events. It turns out that they use basically the same social cues that they use to know that someone is communicating to them—such things as the solicitation of eye contact, calling the child's name, and so on—supplemented by pragmatic/contextual information about the adult's intentions. Then, having recognized the adult's pedagogical motive, they receive the communication and they trust the information they are given. Harris (2012, see for a review) has mapped out the many and various ways in which young children are predisposed to trust the information provided to them by adults, along with the many and various ways that they assess different adults for their potential trustworthiness and reliability. None of this can be taken for granted, as when a human attempts to tell or show a chimpanzee where some hidden food is located—to intentionally communicate useful information to them—they seem not to comprehend the communicative intention (Tomasello, 2006).

Second, perhaps the most novel and exciting contribution of the theory of natural pedagogy is the insight that when adults are instructing they are attempting to convey generic, not episodic, information. Thus, an adult might communicate to a child that there is a nut on the ground that she might want to eat, but, in another context, the adult might attempt to teach the child that nuts like these are typically found under trees like these (e.g., "Chestnuts grow on these kinds of trees"). Csibra and Gergely (2009) have emphasized that adults in all cultures communicate in this generic mode at least some of the time with their children in instruction contexts (especially socially crucial information like kinship status and how to behave in public; see also Kruger & Tomasello, 1996), and as far as we know, no other animal species communicates generic information of this kind at all. In a recent study, Butler and Markman (2012) found that when adults instruct a child about a novel artifact by demonstrating how it works with pedagogical cues, the child is much more likely to generalize this information to novel objects of the same type than if they see that same demonstration not aimed at them pedagogically. Several interpretations of this effect are possible, but a plausible view is that children trust pedagogical communication and generalize it to new items because they see its generic formulation as coming from the cultural knowledge of their social group, with the instructor acting as a kind of authoritative representative. When the adult says, "Chestnuts grow on these kinds of trees" she is not giving her opinion but rather imparting an objective fact about the world as "we" know it.

Interestingly, recent research has also found that young children themselves engage in instruction at a much younger age than previously thought. Thus, some evidence for this is apparent in the studies of so-called "transmission chains," in which young children learn something and then teach another (and then another down the chain; e.g., Flynn & Whiten, 2008; Tennie, Walter, Gampe, Carpenter, & Tomasello, 2014). In addition, in the studies of norm enforcement cited above (e.g., Rakoczy et al., 2008), in many cases when 3-year-old children corrected norm violators (e.g., "No, it doesn't work like that"), they continued by instructing the violator about how to do it properly. This instruction quite often was formulated in generic language as well, for example, "These things go there!" And so, the two main ways that young children use generic language themselves are in instructing others pedagogically in generalized cultural knowledge and in enforcing the norms of behavior formulated by the cultural group (see Köymen et al., 2014; Tomasello, 2016). This lends support to the characterization of pedagogical learning as cultural learning in the sense that its authority emanates from the cultural group and its institutions, as larger and objective realities that predated the child's arrival on the scene. Indeed, this authority is so strong that if a child is instructed in how to use a novel artifact (which has several possible functions), they tend to stick with that function almost exclusively and so ignore its other interesting functions (much more than if left to explore it on their own without instruction; Bonawitz et al., 2011).

The significance of instructed or pedagogical learning in human evolution cannot be overstated. Cumulative cultural evolution is only possible because all individuals of a particular generation mostly learn the same thing from their elders, and so this is reliable and stable over time for all individuals—which sets the stage for any of them to potentially innovate. Obviously, when adults normatively expect children to learn, and they enforce these normative expectations, this creates precisely the kind of cultural ratchet that keeps cultural knowledge and practices stable over time until the novel innovation occurs. There may be considerable variation in how instruction happens in different cultures, varying from the explicit verbal instruction in generic normative language of Western educational systems to the normative expectations embodied in adults' "guided participation" of children in more traditional small-scale societies

(e.g., Rogoff, 1990, 2003). But some process in which adults normatively expect children to learn is a necessary component in the way that human cultures persist and evolve in the ways that they do.

Two significant cross-cultural differences in instructed learning—that is, not in the way that adults interact with and instruct children but in the way that children learn from such interactions and instruction—are these. First, in a series of studies Rogoff and colleagues have shown that young children from small-scale Mayan cultures attend to the actions of others as they engage in tasks more patiently and attentively than young children from larger scale industrialized cultures (e.g., Correa-Chávez & Rogoff, 2009; López, Correa-Chávez, Rogoff, & Gutiérrez, 2010; Silva, Correa-Chávez, & Rogoff, 2010). This presumably reflects the lesser importance of direct adult instruction and the greater importance of children learning through observation, in these small-scale cultures. Second, Harris and Corriveau (2013) have reviewed evidence suggesting that children from some Asian cultures are more likely than children from North America to interact with adults with "respectful deference." This means that some Asian children tend to conform to adult demonstrations and instruction more than do North American children, presumably reflecting a cultural context in which individuals with greater experience are trusted implicitly, even overriding the learner's own experience in many cases.

Despite these cultural differences in learning styles, as we may call them, a key question is whether young children in different cultures are engaging in fundamentally different processes of cultural learning, or whether, in contrast, children everywhere are learning in the same basic way when they are in the same kinds of social-interactive circumstances, and what differs across cultures is the kinds of social circumstances in which children learn (and children come to expect the kinds of contexts in which they will be learning). To date, we have very little evidence to help settle this question.

Collaborative Learning

Tomasello et al. (1993) focused on collaborative learning as co-construction, that is, not as a process of cultural transmission per se, but rather as one of cultural creation. They were thus concerned with situations like collaborative problem solving in which two school-aged peers are better able to solve Piagetian conservation problems together than either is alone (Perret-Clermont & Brossard, 1985). Or, similarly, they were concerned with the way that two school-aged peers are able to reason at a more sophisticated level about moral problems than either of them is when interacting with an adult (Kruger & Tomasello, 1986). In collaborating with peers, young children build an understanding of the problem together—more complex than either could build alone—and each internalizes the representation.

In recent years much more has been learned about how even younger children collaborate with one another. Motivationally, young children are more motivated to work to solve problems collaboratively with others than they are to work to solve problems alone. Thus, when given a free choice, preschool children prefer to collaborate with a partner rather than work alone (which is not true of great apes; Rekers, Haun, & Tomasello, 2011), and moreover, this motivation for collaboration leads them to work harder and persist longer on the problem, and enjoy it more, than if they work at it on their own (Butler & Walton, 2013). Cognitively, preschool children understand when they do and do not have a joint goal and joint attention with a partner (which is also not true of great apes; see Tomasello & Hamann, 2012, for a review). In addition, preschool children can reverse roles with a collaborative partner (Carpenter, Tomasello, & Striano, 2005), and even take her perspective and learn her role (again not true of great apes; Fletcher, Warneken, & Tomasello, 2012). Tomasello (2014) calls this the dual-level structure of shared intentionality: shared goals and attention, on the one hand, and individual roles and perspectives, on the other hand, all in one collaborative activity.

With regard to collaborative co-construction in particular, there are two recent bodies of research of particular relevance. First, the process of collaborative learning has been studied extensively in classroom settings with school-age children (and adults). Although there is much research on children learning in collaborative situations, the problem has been that in many instances control conditions have been lacking, so that even when collaboration produces better learning than individual problem solving we do not know why (Kuhn, Hemberger, & Khait, 2014). For example, it may be that with more children there is simply more information openly expressed and so more imitation and social learning than in individual learning situations. However, Schwarz, Neuman, and Biezunger (2000) used appropriate controls and

found that the key to cognitive advances in young children in collaborative situations is when (a) they come to share a representation of the problem situation with a partner or partners, and (b) at the same time the various partners have conflicting opinions or positions on the best solution ("two wrongs make a right"). In these cases young children actually engage with one another's thinking, and not just—as is often the case—simply participating in the discourse by saying something that seems generally relevant (e.g., "Oh, and here's another thing.") that others may then learn. This characterization of the optimum situation for collaborative learning would seem to emanate directly from the dual-level structure of sharedness and individuality characteristic of shared intentional activities in general: a shared understanding of the situation with nevertheless different individual perspectives.

Beyond even this, Kuhn, Zillmer, Crowell, and Zavala (2013) have found that an especially facilitative context for the co-construction of knowledge is situations in which peers collaborate with one another to formulate arguments against other collaborating peers (team against team). In such situations the individual child both engages with the thinking of their "adversary" and, at the same time, collaborates with a teammate to find the best way of doing that. Kuhn et al. (2013) also found that in this context children engage especially frequently in "metatalk about standards of evidence and arguments," which are of crucial importance in coming to be effective participants in-group problem solving and are precisely the missing elements in many of children's more directionless discussions and arguments. Indeed, metatalk of this type is the way in which children may co-construct for themselves—perhaps influenced as well by their previous experience with adults—normative standards of argumentation that must be followed up for productive discussions. In all, recent research has demonstrated rather convincingly that collaborative learning leads not just to the acquisition of more and better information, but also to skills in the co-construction of knowledge with others, as well as to more and better skills of thinking, and thinking about thinking, so that individual children come to respect rational norms of discourse and argumentation.

The second line of relevant research is children's collaborative co-construction of social rules and norms. Thus, when triads of preschool children are faced with a complex game apparatus and only told a general goal, they often react to obstacles by creating normative rules for how to deal with them (e.g., "When X happens, you have to Y"). They subsequently transmit these rule to naive partners using normative language like *should* and *must* often in generic format, for instance, "One should do it like this" or "It works like this" (Göckeritz, Schmidt, & Tomasello, 2014). Preschool children are thus capable of co-constructing rules for themselves in their collaborative interactions, and they are committed to the idea that these rules apply, that is, should apply normatively, to everyone who participates in the game. Interestingly, when children are working together to come to a joint decision in situations such as these, they also may engage in cooperative argumentation in which they co-construct with a partner who shares their cultural common ground—in a way that they cannot without such cultural common ground—a decision that neither of them would have made on their own. This ability is based on the cooperative exchange of reasons and justifications in dialogic interaction, in which each partner is committed to a collaborative solution based on the exchange of perspectives (Köymen et al., 2014).

There are very few studies of peer interaction and/or peer cooperation employing cross-cultural samples, and even fewer focused on collaborative learning per se. The study of clearest relevance to current concerns is one conducted by Mejía-Arauz, Rogoff, Dexter, and Najafi (2007). They had triads of young children collaborate together on a task. They found that the children from a more small-scale traditional culture worked together better, and more nonverbally, than the children from a Western industrialized culture. This presumably reflects the different interaction and learning styles the children brought to the task.

In general, collaboration is key to cultural learning and transmission, as many cultural traditions are transmitted when individuals interact with others collaboratively in common circumstances (e.g., those structured by institutional rules and other types of social norms). However, collaboration is also key to cultural co-construction and creation, including creations that then embody normative standards that others must follow. We might thus emphasize here that although Tomasello et al. (1993) focused more on the evolutionist's definition of culture in terms of the cultural (rather than genetic) *transmission* of information, we can appreciate even more the role of collaboration in cultural interactions if we focus as well on the anthropologist's definition of culture in terms of social *coordination* (i.e., the cooperative, communicative, and institutional interactions that constitute a

culture at any given moment), again with the clarification that such coordination is structured by the normative standards that are collaboratively created. With this focus on coordination and normativity, we can clearly see that collaboration and collaborative learning are at the heart of both cultural learning and cultural creation. This does not obviate, of course, the fact that children sometimes also engage in various kinds of intergroup conflict and aggression, stereotyping, social exclusion, and other forms of noncooperative behavior; it is just that, for current purposes, this is not key to their cultural learning.

Cultural Learning and Learning Culture

"Many animal species live in complex social groups; only humans live in cultures." Tomasello et al. (1993) began their article with this observation, specifying in particular that human cultures accumulate modifications over time so that particular artifacts and practices have cultural histories. They put much weight on research at the time showing that young children are more motivated and skillful imitators than are other great apes. But in light of recent research we should probably place more weight on the facts that (a) young children not only imitate others, but they also feel normative pressure to conform to the group and its ways; (b) when young children discern that they are being instructed, they construe this instruction as generic, immediately generalizable knowledge coming from the authoritative voice of the culture; and (c) young children solve collaborative problems by taking one another's perspective and co-constructing normative rules based on their skills and motivations for shared intentionality. Children do not just learn to act like others in their culture act, they conform to the culture's expectations, and indeed contribute themselves to the creation of such shared expectations.

From an evolutionary point of view, all of these novelties come from humans' especially cooperative ways of living, especially the various forms of group-mindedness that emerged with human cultural life (Tomasello, 2014). Thus, as soon as humans were living in cultural groups that competed with other cultural groups, group identification via behavioral conformity to the group became crucial. Being prone to receiving normative or other kinds of instruction as being authoritative and generalizable became crucial to being a competent group member. And while collaboration has evolutionary roots from before the emergence of culture, in a cultural setting the co-construction of material and symbolic artifacts and cultural practices with others became an integral part of cultural living as well.

And so, modern human children are prepared for cultural life by having skills and motivations for all aspects of shared intentionality, from collaborating with others to learning from them in special ways. And of special importance in the current context—because of its relative neglect in Tomasello et al. (1993)—young children are subject as well to normative pressures from the group to conform. The fact that from a young age children also actively participate in applying such normative pressures to groupmates themselves suggests that they are not just conforming strategically to avoid negative consequences, but rather they are participating—as both consumers and producers, as it were—in a more group-minded process aimed at maintaining and reinforcing the conventional lifeways of their cultural group.

And so the main amendment to Tomasello et al.'s (1993) theory of cultural learning is that children do not just learn useful things from others, but rather they experience from others in their culture normative pressures to conform, and they are predisposed to accede to these pressures. This changes the nature of all three component processes of cultural learning as originally formulated. In terms of cross-cultural differences, the evidence, especially experimental evidence, is extremely limited. But by all indications the most basic processes of cultural learning are universal among human groups, with some stylistic differences arising because children developing in different types of social interactions come to expect different types of learning experiences. But this universality of process most emphatically does not mean that the content of what is learned—learning culture, as we may call it—is universal. Indeed, what children are learning via imitation, instruction, and collaboration are very different cultural conventions, norms, and institutions, deriving from the very different lifeways of people living in different cultural arrangements. The interaction between cultural learning and learning culture is a key question for future research.

References

Akhtar, N., & Tomasello, M. (1996). Two-year-olds learn words for absent objects and actions. *British Journal of Developmental Psychology*, *14*, 79–93.

Beisert, M., Zmyj, N., Liepely, R., Jung, F., Prinz, W., & Daum, M. (2012). Rethinking "rational imitation" in 14-

month-old infants: A perceptual distraction approach. *PLoS One*, *7*, e32563. doi:10.1371/journal.pone.0032563

Bellagamba, F., & Tomasello, M. (1999). Re-enacting intended acts: Comparing 12- and 18-month-olds. *Infant Behavior and Development*, *22*, 277–282.

Bonawitz, E., Shafto, P., Gweon, H., Goodman, N. D., Spelke, E., & Schulz, E. (2011). The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition*, *120*, 322–330. doi:10.1016/j.cognition.2010.10.001

Bruner, J. (1993). Commentary of Tomasello et al. (1993). *Behavioral and Brain Sciences*, *16*, 553–554.

Butler, L. P., & Markman, E. M. (2012). Preschoolers use intentional and pedagogical cues to guide inductive inferences and exploration. *Child Development*, *83*, 1416–1428. doi:10.1111/j.1467-8624.2012.01775.x

Butler, L. P., & Walton, G. M. (2013). The opportunity to collaborate increases preschoolers' motivation for challenging tasks. *Journal of Experimental Child Psychology*, *116*, 953–961. doi:10.1016/j.jecp.2013.06.007

Buttelmann, D., Carpenter, M., Call, J., & Tomasello, M. (2007). Enculturated chimpanzees imitate rationally. *Developmental Science*, *10*, F31–F38.

Buttelmann, D., Zmyj, N., Daum, M. M., & Carpenter, M. (2013). Selective imitation of in-group over out-group members in 14-month-old infants. *Child Development*, *84*, 422–428. doi:10.1111/j.1467-8624.2012.01860.x

Callaghan, T., Moll, H., Rakoczy, H., Warneken, F., Liszkowski, U., Behne, T., & Tomasello, M. (2011). Early social cognition in three cultural contexts. *Monographs of the Society for Research in Child Development*, *76*(2). doi: 10.1111/j.1540-5834.2011.00603.x

Carpenter, M. (2006). Instrumental, social, and shared goals and intentions in imitation. In S. J. Rogers & J. Williams (Eds.), *Imitation and the social mind: Autism and typical development* (pp. 48–70). New York, NY: Guilford.

Carpenter, M., Call, J., & Tomasello, M. (2002). Understanding' prior intentions enables 2-year-olds to imitatively learn a complex task. *Child Development*, *73*, 1431–1442.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development*, *63* (4, Serial No. 255).

Carpenter, M., Tomasello, M., & Striano, T. (2005). Role reversal imitation in 12 and 18 month olds and children with autism. *Infancy*, *8*, 253–278. doi:10.1207/s15327078in0803_4

Correa-Chávez, M., & Rogoff, B. (2009). Children's attention to interactions directed to others: Guatemalan Mayan and European American patterns. *Developmental Psychology*, *45*, 630–641. doi:10.1037/a0014144

Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, *13*, 148–153. doi:10.1016/j.tics.2009.01.005

Fletcher, G. E., Warneken, F., & Tomasello, M. (2012). Differences in cognitive processes underlying the collaborative activities of children and chimpanzees. *Cognitive Development*, *27*, 136–153. doi:10.1016/j.cogdev.2012.02.003

Flynn, E., & Whiten, A. (2008). Cultural transmission of tool use in young children: A diffusion chain study. *Social Development*, *17*, 699–718. doi:10.1111/j.1467-9507.2007.00453.x

Gergely, G., Bekkering, H., & Király, I. (2002). Rational imitation in preverbal infants. *Nature*, *415*, 755. doi:10.1038/415755a

Gergely, G., & Csibra, G. (2006). Sylvia's recipe: The role of imitation and pedagogy in the transmission of human culture. In N. Enfield & S. Levinson (Eds.), *Roots of human sociality: Culture, cognition, and interaction* (pp. 229–255). Oxford, UK: Berg.

Göckeritz, S., Schmidt, M. F. H., & Tomasello, M. (2014). Young children's creation and transmission of social norms. *Cognitive Development*, *30*, 81–95. doi:10.1016/j.cogdev.2014.01.003

Grosse, G., Moll, H., & Tomasello, M. (2010). 21-month-olds understand the cooperative logic of requests. *Journal of Pragmatics*, *42*, 3377–3383. doi:10.1016/j.pragma.2010.05.005

Harris, P. (2012). *Trusting what you're told: How children learn from others*. Cambridge, MA: Harvard University Press.

Harris, P. L., & Corriveau, K. H. (2013). Respectful deference: Conformity revisited. In M. R. Banaji & S. A. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 230–234). New York: Oxford University Press.

Haun, D. B. M., & Tomasello, M. (2011). Conformity to peer pressure in preschool children. *Child Development*, *82*, 1759–1767. doi:10.1111/j.1467-8624.2011.01666.x

Haun, D., & Tomasello, M. (2014). Great apes stick with what they know; children conform to others. *Psychological Science*. Advance online publication. doi:10.1177/0956797614553235

Herrmann, E., Call, J., Lloreda, M., Hare, B., & Tomasello, M. (2007). Humans have evolved specialized skills of social cognition: The cultural intelligence hypothesis. *Science*, *317*, 1360–1366. doi:10.1126/science.1146282

Herrmann, P., Legare, C., Harris, P., & Whitehouse, H. (2013). Stick to the script: The effect of witnessing multiple actors on children's imitation. *Cognition*, *129*, 536–543. doi:10.1016/j.cognition.2013.08.010

Heyes, C. M., & Frith, C. (2014). The cultural evolution of mind reading. *Science*, *344*, 1243091. doi:10.1126/science.1243091

Horner, V., & Whiten, A. (2005). Causal knowledge and imitationemulation switching in chimpanzees (*Pan troglodytes*) and children (*Homo sapiens*). *Animal Cognition*, *8*, 164–181.

Huang, C. T., & Charman, T. (2005). Gradations of emulation learning in infants' imitation of actions on objects. *Journal of Experimental Child Psychology*, *92*, 276–302. doi:10.1016/j.jecp.2005.06.003

Huang, C.-T., Heyes, C. M., & Charman, T. (2002). Infants' behavioral re-enactment of "failed attempts": Exploring the roles of emulation learning, stimulus enhancement and understanding of intentions. *Developmental Psychology*, *38*, 840–855. doi:10.1037/0012-1649.38.5.840

Huang, C.-T., Heyes, C. M., & Charman, T. (2006). Preschoolers' behavioral reenactment of "failed attempts": The roles of intention-reading, emulation and mimicry. *Cognitive Development*, *21*, 36–45. doi:10.1016/j.cogdev.2005.09.002

Klossek, U., Russell, J., & Dickinson, A. (2008). The control of instrumental action following outcome devaluation in young children aged between 1 and 4 years. *Journal of Experimental Psychology: General*, *137*, 39–51. doi:10.1037/0096-3445.137.1.39

Köymen, B., Lieven, E., Engemann, D. A., Rakoczy, H., Warneken, F., & Tomasello, M. (2014). Children's norm enforcement in their interactions with peers. *Child Development*, *85*, 1108–1122.

Kruger, A., & Tomasello, M. (1986). Transactive discussions with peers and adults. *Developmental Psychology*, *22*, 681–685.

Kruger, A., & Tomasello, M. (1996). Cultural learning and learning culture. In D. Olson (Ed.), *Handbook of education and human development: New models of teaching, learning, and schooling* (pp. 369–387). Cambridge, MA: Blackwell.

Kuhn, D., Hemberger, L., & Khait, V. (2014). *Argue with me: Argument as a path to developing students' thinking and writing*. New York, NY: Wessex.

Kuhn, D., Zillmer, N., Crowell, A., & Zavala, J. (2013). Developing norms of argumentation: Metacognitive, epistemological, and social dimensions of developing argumentive competence. *Cognition & Instruction*, *31*, 456–496. doi:10.1080/07370008.2013.830618

López, A., Correa-Chávez, M., Rogoff, B., & Gutiérrez, K. (2010). Attention to instruction directed to another by US Mexican-heritage children of varying cultural backgrounds. *Developmental Psychology*, *46*, 593–601. doi:10.1037/a0018157

Lyons, D. E., Young, A. G., Frank, C., & Keil, F. C. (2007). The hidden structure of overimitation. *Proceedings of the National Academy of Sciences of the United States of America*, *104*, 19751–19756. doi: 10.1073/pnas.0704452104

Mejía-Arauz, R., Rogoff, B., Dexter, A., & Najafi, B. (2007). Cultural variation in children's social organization. *Child Development*, *78*, 1001–1014. doi:10.1111/j.1467-8624.2007.01046.x

Meltzoff, A. N. (1995). What infant memory tells us about infantile amnesia: Long-term recall and deferred imitation. *Journal of Experimental Child Psychology*, *59*, 497–515.

Meltzoff, A. N., & Moore, K. (1977). Imitation of facial and manual gestures by human neonates. *Science*, *198*, 75–78.

Nielsen, M., & Tomaselli, K. (2010). Over-imitation in Kalahari Bushman children and the origins of human cultural cognition. *Psychological Science*, *21*, 729–736. doi:10.1177/0956797610368808

Over, H., & Carpenter, M. (2013). The social side of imitation. *Child Development Perspectives*, *7*, 6–11. doi:10.1111/cdep.12006

Paulus, M., Hunnius, S., Vissers, M., & Bekkering, H. (2011). Imitation in infancy: Rational or motor resonance? *Child Development*, *82*, 1047–1057. doi: 10.1111/j.1467-8624.2011.01610.x

Perret-Clermont, A.-N., & Brossard, A. (1985). On the interdigitation of social and cognitive processes. In R. A. Hinde, A.-N. Perret-Clermont, & J. Stevenson-Hinde (Eds.), *Social relationship and cognitive development* (pp. 309–327). Oxford, UK: Clarendon Press.

Rakoczy, H., Hamann, K., Warneken, F., & Tomasello, M. (2010). Bigger knows better? Young children selectively learn rule games from adults rather than from peers. *British Journal of Developmental Psychology*, *28*, 785–798.

Rakoczy, H., Warneken, F., & Tomasello, M. (2008). The sources of normativity: Young children's awareness of the normative structure of games. *Developmental Psychology*, *44*, 875–881. doi:10.1037/0012-1649.44.3.875

Rekers, Y., Haun, D. B. M., & Tomasello, M. (2011). Children, but not chimpanzees, prefer to collaborate. *Current Biology*, *21*, 1756–1758. doi:10.1016/j.cub.2011.08.066

Rogoff, B. (1990). *Apprenticeship in thinking. Cognitive development in social context*. New York: Oxford University Press.

Rogoff, B. (2003). *The cultural nature of human development*. New York, NY: Oxford University Press.

Schmidt, M. F. H., Rakoczy, H., & Tomasello, M. (2011). Young children attribute normativity to novel actions without pedagogy or normative language. *Developmental Science*, *14*, 530–539. doi:10.1111/j.1467-7687.2010.01000.x

Schwarz, B., Neuman, Y., & Biezunger, S. (2000). Two wrongs may make a right if they argue together! *Cognition and Instruction*, *18*, 461–494.

Schwier, C., van Maanen, C., Carpenter, M., & Tomasello, M. (2006). Rational imitation in 12-month-old infants. *Infancy*, *10*, 303–311. doi:10.1371/journal.pone.0032563

Silva, K. G., Correa-Chávez, M., & Rogoff, B. (2010). Mexican-heritage children's attention and learning from interactions directed to others. *Child Development*, *81*, 898–912. doi:10.1111/j.1467-8624.2010.01441.x

Southgate, V., Johnson, M. H., Osborne, T., & Csibra, G. (2009). Predictive motor activation during action observation in human infants. *Biology Letters*, *5*, 769–772. doi:10.1098/rsbl.2009.0474

Tennie, C., Call, J., & Tomasello, M. (2009). Ratcheting up the ratchet: On the evolution of cumulative culture. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*, 2405–2415. doi:10.1098/rstb.2009.0052

Tennie, C., Walter, V., Gampe, A., Carpenter, M., & Tomasello, M. (2014). Limitations to the cultural ratchet effect in young children. *Journal of Experimental Child Psychology*, *126*, 152–160. doi:10.1016/j.jecp.2014.04.006

Thornton, A. N., & Raihani, N. J. (2008). The evolution of teaching. *Animal Behaviour*, *75*, 1823–1836.

Tomasello, M. (2006). Why don't apes point? In N. J. Enfield & S. C. Levinson (Eds.), *Roots of human sociality. Culture, cognition, and interaction* (pp. 506–524). Oxford, UK: Berg.

Tomasello, M. (2014). *A natural history of human thinking*. Cambridge, MA: Harvard University Press.

Tomasello, M. (2016). *A natural history of human morality*. Cambridge, MA: Harvard University Press.

Tomasello, M., & Barton, M. (1994). Learning words in non-ostensive contexts. *Developmental Psychology*, *30*, 639–650.

Tomasello, M., & Carpenter, M. (2005). The emergence of social cognition in three young chimpanzees. *Monographs of the Society for Research in Child Development*, *70* (Serial No. 279).

Tomasello, M., & Hamann, K. (2012). Collaboration in young children. *Quarterly Journal of Experimental Psychology*, *65*, 1–12. doi:10.1080/17470218.2011.608853.

Tomasello, M., Kruger, A., & Ratner, H. (1993). Cultural learning. *Behavioral and Brain Sciences*, *16*, 495–552.

Vaish, A., Herrmann, E., Markmann, C., & Tomasello, M. (2016). *Three-year-olds prefer norm enforcers*. Manuscript submitted for publication.

Watson-Jones, R., Legare, C., Whitehouse, H., & Clegg, J. (2014). Task-specific effects of ostracism on imitation in early childhood. *Evolution and Human Behavior*, *35*, 204–210. doi:10.1016/j.evolhumbehav.2014.01.004

Whiten, A. (2005). The second inheritance system of chimpanzees and humans. *Nature*, *437*, 52–55. doi:10.1038/nature04023

Whiten, A., Horner, V., & de Waal, F. B. M. (2005). Conformity to cultural norms of tool use in chimpanzees. *Nature*, *437*, 737–740. doi:10.1038/nature04047