

What does it mean to teach? Redefining the teacher in an era of misconception

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Abstract

It seems that in the mind of the public, teachers have come to be defined by what they solicit (protection in the form of a union) and what they fail to elicit (passing scores for students on standardized tests) as opposed to what it is they do, which is teach. This misinterpretation may very well arise from the lack of clarity in defining the practice of teaching. Using the emerging recognition of non-human animals as social transmitters of information to provide insight into what teaching is from an evolutionary perspective, this paper explores the inextricable link between biology and educational philosophy. Using Dewey's (1902, 1944, 1953) polymathic approach to investigating and understanding education as both a model and a foundation, this paper identifies nexus points between pedagogical theory, cognitive neuroscience, and ethology. The result is a redefinition of both the teacher and the act of teaching that has the potential to bring clarity to the purpose of a profession that has long suffered from public—and political—misperception.

Keywords: Teaching, John Dewey, social transmission, academic optimism, evolutionary education, teacher evaluation

DOI: 10.29329/ijpe.2018.139.13

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Introduction

There has been a general dissatisfaction with teachers as of late. It has manifested itself on multiple fronts, ranging from frustration that teacher unions in the United States have a single-minded focus on increasing teacher pay and benefits (Brimelow, 2004), to the inability to implement market-based reforms of teacher evaluation (Eberts, Hollenbeck, & Stone, 2002), to teacher preparation programs that have little effect on the readiness of new teachers (Walsh & Podgursky, 2001). The public outcry against American teachers came to a head in the past year, where the governor of Wisconsin helped precipitate a pitched battle over the right of teachers to collectively bargain in his state (Lyman, 2011), and the teachers of the Chicago school district went on strike to begin the school year in response to a contract that would have included student test scores as a component of their evaluations (Luce, 2012). Outside of the United States, researchers for the World Bank have argued that unions are preventing educational progress (Bruns & Luque, 2014), in part because teacher unions are the ones fighting against school choice and tying pay to standardized testing (Weiner, 2012). Due to their activities, “teacher unions have been singled out for attack because throughout the world they are the most significant barriers to this project’s implementation” (Weiner, 2012, p. 89).

Taken together, these cases reflect the two principal but *proximate* causes of frustration with teachers; one represents the issue of the power of unions (Moe, 2011), while the other is representative of the decided lack of improvement by students on standardized external measures of knowledge (Fleischman, Hopstock, Pelczar, & Shelley, 2010; OECD, 2012). The ultimate cause of the public’s frustration with teachers derives not from what they or their unions are or are not doing, but a lack of a clear understanding of what teachers are or, perhaps more importantly, what they should be.

Observed from this standpoint, that of the linguistic analyst, being a *teacher* has become synonymous with *union member* and *individual responsible for student test scores*. It seems that, what has largely become lost in the public’s analysis of the teacher is that, above all else, it is the teacher’s job to *teach*. Unfortunately, there exists widely disparate perceptions of what *teaching* means to the highly select group that consider themselves educational philosophers, much less a republic of 330 million citizens or a global population of 7.6 billion, so it is almost justifiable that the teacher gets reduced in psychological stature to a few highly quantifiable metrics that easily allow for definition and evaluation. This desire for calculability, likely a product of modernism and the industrialization of all aspects of culture (Ritzer, 2010), leads to a rationalization about the profession of teaching that is highly irrational, for this rationalization fails to capture the essence of the countless acts that define the vocation. In order to be able to truly evaluate the teacher, one must know what *teaching* is. It is therefore the humble goal of this paper to proffer an explanation of the act in the hopes that teachers might be evaluated by the single index that should define their profession: one’s capacity *to teach*.

Can Teaching Be Defined?

When one seeks to define teaching, he or she could do much worse than Pearson’s (1989) definition. He posited that

When faced with the question of determining whether an action is a teaching action, as opposed to some other action such as reciting, talking or acting in a play, it is the intention of bringing about learning that is the basis for distinguishing teaching from other activities. The intention the activity serves, then, is a part of the meaning of the concept, and not a factual discovery one makes about the activity (p. 66).

Viewed from this perspective, teaching becomes about *intentionally* bringing about learning in students. The presence of intentionality suggests that a teacher is capable of discerning a student’s naïveté, something that requires what is widely referred to in psychological circles as a “theory of mind” (Leslie, 1987; Premack & Woodruff, 1978). Due to the significant doubt in the field that exists

about whether other primates possess a theory of mind (Strauss, Ziv, & Stein, 2002; Tomasello, Carpenter, Call, Behne, & Moll, 2005; Tomasello, Kruger, & Ratner, 1993), it should come as no surprise that a recent review by Csibra and Gergely (2011) has concluded that humans are the only species to possess what they consider a natural pedagogy. With the seemingly unique capacity to impute the mental states of others as well as to communicate intentions verbally, Csibra and Gergely (2011) claim that the natural pedagogy that exists is essentially the ability to explain. And yet the same researchers state that they “do not think that there is a single cognitive or psychological factor...that makes humans unique” (p. 1155). How is this possible?

This contradiction may be a product from the mistaken assumption that the capacity for language is unique in humans. When viewed from a neurological standpoint, homologs for the two regions of the brain most frequently associated with linguistics, Broca’s and Wernicke’s areas, have been identified in non-human primates (Gannon, Holloway, Broadfield, & Braun, 1998; Gil-da-Costa et al., 2006; Spocter et al., 2010; Tagliabate, Russell, Schaeffer, & Hopkins, 2008). It has also been posited that the seat of language processing in humans exists not in the primate, or even mammalian portions of the brain but within the reptilian region (Lieberman, 2002), suggesting that language may simply be the outward manifestation of the necessity of social species to communicate. This recognition would explain why, from a behavioral standpoint, it has been identified that the primary function of vocalizations is to communicate social standing within the group for both humans (Calude & Pagel, 2011) and non-humans (Seyfarth & Cheney, 2010). If this is the case, while language may be used to ascertain and transmit information of a social nature, it may not always provide the best method for transferring *all* information.

Due to the apparent purpose and intentionality of vocalizations across a wide variety of taxa including humans, but its assigned importance to teaching only in *humans*, were one to try to identify teaching in other species, it seems the definition would be quite different than the one proffered by Pearson (1989). Into this apparent void stepped two pairs of researchers nearly two decades apart. The first duo, Caro and Hauser (1992) proposed that

An individual actor A can be said to teach if it modifies its behaviors only in the presence of a naive observer, B, at some cost or at least without obtaining an immediate benefit for itself. A’s behavior thereby encourages or punishes B’s behavior, or provides B with experience or sets an example for B. As a result, B acquires knowledge or learns a skill earlier in life or more rapidly or efficiently than it might otherwise do, or that it would not learn at all. (p. 153)

By approaching the question of teaching from an empirical and scientific perspective, Caro and Hauser (1992) produced a definition that explicitly omits the concept of *intentionality*, instead emphasizing *learning* in the naïve pupil.

This definition provoked responses from psychologists that focused on the fact that all of non-human teaching seemed to be focused purely on foraging (Premack & Premack, 1996) and was done without the sort of intentionality that comes from the possession of a theory of mind (Strauss et al., 2002; Tomasello et al., 1993, 2005). The collective academic wake of this backlash seemingly stifled any subsequent reviews for the next fifteen years. Then, on the backs of three studies (Raihani & Ridley, 2008; Richardson, Sleeman, McNamara, Houston, & Franks, 2007; Thornton & McAuliffe, 2006), a review was published by Thornton and Raihani (2008) that—using Caro and Hauser (1992) as a model—proposed a new biological framework that suggested teaching is: 1) a form of cooperative behavior with response-dependent fitness payoffs, 2) an action whose function is to facilitate learning in others, and 3) a behavior that involves the coordinated interaction of a donor and a receiver of information (p. 1825). In the review, though they explain that the uniquely human capacity to infer the cognition of others may affect teaching in some areas, many forms of human tuition do not require teachers to impute mental states to pupils. This suggests that there may be the intention to transmit information present without there existing a theory of mind in the teacher.

That conclusion is important for three reasons. The first reason that these definitions are important is that, by eliminating the necessity of a theory of mind to teaching, they present the possibility of even richer avenues for teaching existing in those species (i.e. humans) that are in possession of the capacity to infer not only the relative ignorance of another individual but the ability to facilitate an experience that will provide the greatest chance at the acquisition of knowledge and skills by the receiver of the information because of this capacity. The second reason is that these definitions, particularly the Thornton and Raihani (2008) iteration, emphasize the necessity of a relationship between teacher and student in order for the effective transmission of information to occur. The final reason is it promotes potential definitions of teaching that not only omit the necessity of language, but deemphasize a word that may possibly be more troublesome to define than teaching: learning. Instead, the Caro and Hauser's (1992) definition emphasizes the acquisition of knowledge or skills, a subtle shift that provides the opportunity for the collection of empirical data to evaluate the quality of the teaching based on the effectiveness of the transmission. The clarity provided by these definitions allows for one to more accurately assess what teaching truly should be.

Utilizing Pedagogical and Content Knowledge

As Csibra and Gergely (2011) intimate, humans may well be the only species with a “natural pedagogy,” but that does not mean that an explanation of the purpose for acquiring particular skills or committing to memory bits of knowledge is the ideal method of transmission. Dewey (1902) considered the purpose of early education “... to get hold of the child's natural impulses and instincts, and to utilize them so that the child is carried on to a higher plane of perception and judgment, and equipped with more efficient habits” (p. 127). As his career moved along, Dewey continued to place great weight on utilizing a child's experiences and natural proclivities (Dewey, 1902, 1944, 1953, 1997a; Noddings, 2012) which would serve as a springboard for what he considered “growth” in the child. Dewey (1902, 1944, 1997a) thought this almost ephemeral concept of individual advancement—which in the Caro and Hauser (1992) would likely define as the acquisition of knowledge and skills—is best achieved through play both inside and outside the constructs of the classroom. Different from what he considered “fooling around” (which was detrimental to a child's academic development), Dewey's conception of play is in line with what has been observed by contemporary anthropologists—that in most hunter-gatherer societies, there is no difference between work and play for children (Muller, 2010). And though the idea of play as an avenue for the acquisition of survival skills has been around for over a century (Groos, 1898), it has recently been brought to the forefront of the academic community as a viable method for developing a greater understanding of both information and processes (Brown & Vaughan, 2009). With play working at the interface of procedural (skills) and declarative (information) knowledge, it helps to develop the kind of semantic learning that has been empirically shown to advance both outwardly observable behavior and neural connectivity (Brown & Vaughan, 2009; Marler, 1991).

As an educational philosopher who valued scientific thought, Dewey would likely have appreciated the care with which evolutionary psychologists, ethologists, neurologists, and psychiatrists have compiled data to support his fledgling inclinations towards play as a pedagogical method in light of his interest in evolutionary theory (Dalton, 2002; Dewey, 1929, 1958, 1997b; Popp, 2007). His concern, however, would have been for its tendency to, without careful observation by the teacher, to devolve into the aforementioned “fooling around” (Dewey, 1944). In order to prevent such an unproductive transformation of the learning environment from occurring, the teacher must therefore possess the kind of foresight that enables him/her to ensure that the provided opportunity for play presents the opportunity for the advancement of understanding; otherwise, it is likely that another method may have provided a greater chance for success. This stipulation requires that teachers possess not only the content knowledge necessary to envision the next cognitive step for his/her students, but the kind of pedagogical knowledge necessary to identify the ideal information delivery device. The interface of these two produces a third type of knowledge required of a skilled teacher—pedagogical content knowledge (Shulman, 2004).

Though the cognitive capacity of animal teachers is limited as compared to humans, there exists a difference in intentional transmission techniques in non-human teachers based on whether the required knowledge is fixed (declarative) or progressive (procedural) (Thornton & Raihani, 2008). But when one takes into account the various methods of information transfer in animals whose learning and cultural development has been likened to humans (i.e. other primates and social carnivores) via practices such as observation (De Waal, 2009; Gallese, Fadiga, Fogassi, & Rizzolatti, 1996), master and apprenticeship (Horner, Proctor, Bonnie, Whiten, & de Waal, 2010; Matsuzawa et al., 2001; Whiten, Schick, & Toth, 2009), and participatory “tagging along” (Drea & Carter, 2009; Thornton & Raihani, 2008), the pedagogical possibilities for a species that is as self-aware as humans are seemingly endless. Unfortunately, the overwhelming nature of the aforementioned pedagogical possibilities combined with an ever-growing foundation of available content knowledge may explain why, even when Dewey was working at the turn of the century, that subjects had a tendency to insulate themselves from each other (Dewey, 1902).

The development of essentialism in education (Gutek, 2004) and its contemporary successor, the standards movement (Ravitch, 2011), further entrenched the generation of subject specific curriculum. This development has created intellectual vacuums within classrooms, leading to the kind of dictatorial teaching of abstractions that Dewey espoused was detrimental to the growth of the child for the entirety of his career (Noddings, 2012; Winn & Randall, 1959). He was not alone in this recognition, as his successors (Shulman, 2004), progressive contemporaries, and predecessors dating back to Rousseau all suggested that the teacher’s role was not to dictate facts but facilitate understanding (Noddings, 2012). The forced isolation of the content of the classrooms bears no resemblance to the interactive nature of the “real world,” an effect recognized as far back as Plato’s first writings about the teaching practice of his mentor Socrates (Noddings, 2012). This renders the student’s natural way of encountering the world, so valued by educational psychologists from Piaget (1964, 1970) to Gardner (2000), moot, forcing them into a mode of knowledge acquisition that is likely to leave them unable to create the kind of semantic knowledge necessary to thrive outside of the classroom.

Not surprisingly, pragmatic philosophers—spearheaded by Dewey—and progressives have suggested that it was the teacher’s job to ascertain the student’s ideal mode of learning (Gutek, 2004; Noddings, 2012) and quality of their intelligence (Dewey, 1944). In works throughout his career, Dewey stated that the purpose of this practice was to facilitate growth in the student, but this begs the question, to what end? Is the goal to access the student’s primary facet of intelligence so state-prescribed knowledge has the best chance at cognitive assimilation? Or is it to provide a student insight into her own individuality, producing the kind of natural experience and reflection positive feedback cycle that allows for her to understand her role in the world? Conservatives and educational essentialists would tend to favor the former interpretation, as it would allow for the perpetuation of cultural literacy (Gutek, 2004; Hirsch, Kett, & Trefil, 1988). Creative theorists would certainly argue the latter, for it is through an individual’s identification of his “element” that allows him to live a meaningful, and productive life (Robinson & Aronica, 2009). In either case, if this is the sort of growth Dewey references, providing a “fitness pay-off” (Thornton & Raihani, 2008) and “knowledge a student might not otherwise learn” (Caro & Hauser, 1992), then a teacher must engage in the second facet of true teaching—they must develop some sort of cooperative, caring relationship with the student.

Caring for the Student as a Developing Person and Individual

As alluded to in the Thornton and Raihani’s (2008) definition of teaching, the relationship between teacher and student is “coordinated” and “cooperative.” This relational emphasis aligns with Dewey’s perception of the teacher’s role, for he wrote, in regards to students, “it is the teacher’s business to know what powers are striving for utterance...and what sorts of activity will bring these to helpful expression, in order to supply the requisite stimuli and needed materials” (Winn & Randall, 1959). He recognized that for this level of coordination to occur, a teacher “must be aware of the past

experiences of students, of their hopes, desires, chief interests [in order to] better understand the forces at work that need to be directed and utilized” (p. 135). Such knowledge of the student suggests there has not only been some sort of cooperation on the part of the student but a recognition that the teacher not only cares *about* the student as one who needs to be taught, but cares *for* the student as an individual (Noddings, 2003, 2012).

In order for a caring relationship between the teacher and student to transpire, the teacher must understand where the student is developmentally. Advocated by progressive philosophers going back to Rousseau (Gutek, 2004; Noddings, 2012; Wilson, 1999) and grounded originally in the empiricism of 20th century child psychologists like Piaget and Vygotsky (Wilson, 1999), the capacity of a teacher to understand a student’s likely developmental state has only been heightened by the work of 21st century cognitive neurologists (Gazzaniga, 2009). Such work has allowed the teachers insight into the need for differentiation due to varied modalities of learning (Gardner, 2000), as well as the need for concreteness to facilitate the learning of abstraction (Wilson, 1999) due to the embodied nature of our cognition (Clark, 2016). The necessity to understand a pupil’s biological and experiential development is not unique to humans, for in two species identified as teachers, meerkats and wild pied babblers, modify their practice based on the developmental cues they receive from their pupils (Raihani & Ridley, 2008; Thornton & McAuliffe, 2006).

That development can be ascertained both by external cues and an awareness of a species’ developmental timeline is supported biologically, suggesting that the type of information and fashion in which it is presented could be identified in advance of attempting some form of transmission. Plato, however, argued the reverse, that the presentation of information affects development (Egan, 1997). This seemingly essentialist declaration too is true from a biological standpoint (Gazzaniga, 2009), and it requires that teachers know the students in their classrooms not simply as vessels on a voyage of development but as individuals with different experiences and levels of knowledge. For a teacher—be they human or not—to truly succeed in facilitating even the most modest of Deweyan growth in a student, he/she must be able to identify the student’s level of naiveté in regards to essential skills. This has been observed in two highly social creatures, hyenas (Drea & Carter, 2009) and tandem-running ants (Richardson et al., 2007), whereby the knowledgeable individual awaits feedback cues from the learner before proceeding with adjustment to the level of support provided. Human teachers, however, are at a distinct disadvantage as compared to the non-human teachers mentioned in the previous two paragraphs: all of the animals are a part of communal living species whereby the acquisition of knowledge about their pupils’ level of learning is a product of their constantly close proximity, and in most cases, their being a part of a multi-generational family. Such a situation breeds the kind of trust necessary for a caring relationship to develop (Noddings, 2003), and this in no way mirrors the situation in which most teachers (particularly those in secondary education) find themselves.

In order to elicit the trust required of the cooperation and coordination for a functional student-teacher relationship, a human teacher must be deemed trustworthy, and among the most successful ways to receive this cognitive designation is to be considered authentic. Authenticity from a leadership perspective derives principally from the possession of a clear purpose (Northouse, 2012). As suggested by Dewey (1944), this purpose may be to promote growth in one’s students, or as suggested by Caro and Hauser (1992), it may be to facilitate the acquisition of knowledge or skills that would not happen as successfully in the absence of a teacher. From either perspective, teaching could be considered an act of altruism (Hoppitt et al., 2008). The teacher is therefore not an actor seeking some sort of reciprocity but one with an innate sense of caring (Noddings, 2003) and moral understanding (De Waal, 2009). With the desire to teach being derived from such a strong moral foundation, a teacher’s purpose is likely to produce the sort of pedagogical practice that allows her, as a leader, to promote a classroom climate that will allow her students the opportunity for positive self-development (Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008).

The necessity of creating a classroom culture of optimism cannot be overstated, for without it, learning becomes much more difficult. Initially identified in the social psychology literature as

priming, today the “nudges” people receive—be they natural or unnatural—can shape a person’s response to potential learning experiences (Bargh, 2014). When people are primed in an optimistic manner (e.g. “be clever”) prior to a task, they show more activity in the anterior paracingulate cortex, an area of the brain responsible for monitoring errors, and they slow down their actions in responses to errors (Bengtsson, Dolan, & Passingham, 2011). It seems that focusing on exhibiting a positive trait has activated a part of brain linked to learning (Sharot, 2011). It has also been shown that a person’s beliefs are more likely to be changed when he or she has received good news as opposed to bad news (Garrett & Sharot, 2017), suggesting that both immediate and future behavior are more likely to be changed through an emphasis on optimism. The importance of optimism is only now beginning to be recognized and quantified in school settings, where operating from a position of what has been termed *academic optimism* has not only been linked positively to teacher’s zest for work and perceived success (Sezgin & Erdogan, 2015) but also to increased reading achievement by students (Mitchell & Tarter, 2016).

For most people, optimism is a product of operating not from a position of weakness, but from one of strength (Rath & Conchie, 2008), allowing them to effectively use the cognitive processes they have developed and acquired throughout their lives. For teachers, this would mean assisting students in the identification of their “element,” or the way or form in which they best encounter and interpret the world (Robinson & Aronica, 2009). Such actions would allow students to “put his or her personal stamp on some aspect of the surround” (Sarason, 1990), allowing for the actualization of the sort of creativity that Dewey (1980) and subsequent theorists have suggested is central to human experience (Dutton, 2009; Wilson, 2007). By getting to know one’s students both developmentally and individually, a teacher has the ability to provide a student with the environment most likely to produce the individualized growth in the essential knowledge and skills necessary to facilitate such a cognitive leap. But because the knowledge and skills must be derivative of a student’s self-determined academic direction, it cannot be the state that mandates the essentials necessary to achieve satisfactory growth—this will lead to the sort of uniform conformity that stigmatizes teachers and education (Winn & Randall, 1959). Instead, what must be learned in order for a student to achieve some measure of personal creative success has to be determined through the process of cooperation between a trusted caring teacher and her pupil as they move toward the pupil’s desired goal.

The Facilitation of Evaluation

With the zenith of learning being the exhibition of creativity in a self-selected modality, it should be expected that students would produce some artifacts as they make their way through their formal education. Artifacts, by their very nature, provide opportunity for evaluation not only by their creator but by outside observers that, in some way, engage with the product (Crawford, 2009; Henshilwood & d’Errico, 2011). The generation of something concrete—be it the creation of a brand-new marionette or the rejuvenation of a decrepit motorcycle transmission—activates the human mind in a fashion that is both unique and basal at the same time (Wilson, 1999). This is because in order to create or fix, the mind has to activate both its unique capacity for symbolic thought (Gazzaniga, 2009) and its familiar “rules-of-thumb,” the heuristics it uses to make decisions (Todd, 2000). This synthesis can provide a richness that is absent when dealing purely with abstractions. And perhaps more importantly, it produces a concrete measure for the creator in regards to how much growth has transpired, as well as in what direction more growth is needed to achieve personal success (Crawford, 2009).

For the few in education that have overtly recognized that there exists a possibility to evaluate students in the absence of universal standards, it would come as no surprise that the “Laboratory for Making Things” in Cambridge, MA has been a rousing success. Its creator, Bamberger (1991), recognized that with the emphasis in schooling on symbolic knowledge, it is not surprising that attention focuses on what these children cannot do, and it is also not surprising that the school world sees them not as virtuosos but as “failing to perform.” [We started] from a different assumption,

namely that “hand knowledge” and “symbolic knowledge” constitute equally powerful but different and not equally appreciated ways of organizing worldly phenomena (p. 38).

By focusing on student weaknesses, schools prevent students from developing the optimism necessary to learn (Sharot, 2011), even in the modalities that are most comfortable for them. The emphasis on standardized “essentials” measured with the high stakes tests has become the educational dogma of the past two decades (Ravitch, 2011), and it has prevented students from encountering the sort of low stress investigative environments necessary to allow for the integration of acquired knowledge and skills (Brown & Vaughan, 2009). And it is this interface of procedural and declarative knowledge perpetuates the kind of semantic knowledge that becomes transferable from situation to situation and from person to person (Pinker, 2007). Achieving this type of growth in students is difficult even within a classroom structure *built* to facilitate these sorts of experiences. Bamberger (1991) noted in an interview that among the “Laboratory for Making Things” students;

Some...were terrific at solving mechanical problems, solving problems in building a gear machine, or figuring out how to connect electrical circuits. But—and this is the critical point—when they would make instructions so that *someone else* could build what they had built, or when they tried to describe how it worked...their descriptions, their drawings, and even their notations might focus on features quite different from those you or I might think were the important ones, or were the ones kids are taught to notice in school (Wilson, 1999, p. 283).

With students paired up with teachers in the sort of cooperative and purposeful learning that is exhibited by other animals (Drea & Carter, 2009; Guinet & Bouvier, 1995; Matsuzawa et al., 2001; Richardson et al., 2007; Thornton & McAuliffe, 2006), the teachers received significantly more feedback about the experience they were helping to generate than in a typical classroom centered around the dissemination of “essential” content. This allows them to encounter the limitation of their own compartmentalized learning and to think about the nature of their own understanding—and the process by which it was achieved (Shulman, 2004). A teacher that does this recognizes that, even as he and the student move towards a more abstract understanding of a concept, he does not cease to use more basal methods of interpretation (Egan, 1997). And because this teacher is acting in cooperation with the student, he is able to provide support as his student both pushes himself to succeed both in the requisite creativity and reflection required for deep and transferable learning (Shulman, 2004). Such actions facilitate the growth in understanding through the sort of experiential process advocated by the likes of Dewey (1944) and expected by the human brain (Gazzaniga, 2009; Gigerenzer, 1998).

Teachers that have truly engaged students in the subject matter through the activation of their innate creativity and have become engaged with the process themselves are likely to be well positioned to evaluate the degree to which a student has “acquired knowledge and learned the skills” (Caro & Hauser, 1992) necessary for a “payoff” (Thornton & Raihani, 2008) in their selected endeavor. In the process, the teacher has developed the prestige necessary to inspire followership from his students (Horner et al., 2010), creating the kind of master and apprentice learning characteristic of chimpanzees (Matsuzawa et al., 2001) and humans alike (Wilson, 1999). This sort of learning environment provides a second level of concreteness for evaluation—it provides a concrete example for the student of whom they might become (Crawford, 2009). For the learner, this presents a model for success that closes the gap between her envisioning of the future and its realization (Geary, 2005), and facilitates the sort of reflection necessary to solidify learning (Minkel, 2006; Shulman, 2004). It is only through this cooperation between teacher and student that both can effectively evaluate their success in relation to each other.

The Teacher: One Who Teaches

There is some sentiment among educational practitioners that computers are in line to finally become the teachers our students deserve. They will be able to respond in real time to the information they derive from student entries and provide students with feedback on their progress (Collins &

Halverson, 2009). When one applies the value added model of teacher evaluation in this situation (McCaffrey, Lockwood, Koretz, Louis, & Hamilton, 2004; Sanders & Horn, 1994), a less than satisfactory outcome won't force a district to jump through the legal hoops necessary to terminate a teacher's contract—it will only require an update to the software. And yet the addition of standardized delivery of content to the standards-based tests will only serve to drive education further into abstraction. While this may serve to perpetuate the prevailing culture due to students' inability to wrestle with anything tangible, it will do each student a disservice, for as Dewey concluded, it will prevent the sort of "free inquiry...that may most readily excite intellectual interest in young people" (as cited in Winn & Randall, 1959, p. 135). This will make developing some sort of connection with any aspect of the world more difficult, for humans are, at their most basal level, a social species built to live and work in groups (De Waal, 2006; Dunbar, 1993; King, 1980). In the course of living this naturally interactive life, they are likely to transmit information both vertically and horizontally in a fashion that has made their species unique in their ability to build upon their predecessors' ideas (Whiten, 2011) and improve them through intercultural trades (Ridley, 2010).

By having a teacher that cares not only about their subject and the effectiveness of its transmission but for his students, there exists the opportunity to develop a relationship necessary to perpetuate growth both at an individual and at a cultural level. And through the utilization of the capacities to evaluate information about student understanding and to use varied pedagogical practice, the teacher, regardless of species, will be able to not only bring the student a greater understanding of the world, but of their self-determined place in it. Teachers will therefore produce the kind of citizens that are not just complicit within contemporary culture, but create those that exhibit the most human of characteristics, the ability to contribute to cultural advancement. And because they will have participated with the students every step of the way, they will certainly be in a position to evaluate how much better the student, the world, and they are because of it—regardless of whether they are in a union or not.

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