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Scientific Evidence Indicates Natural Selection and Brain-Based Education Conflict with Human Nature

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Abstract

Natural selection is the key concept in the evolution story explaining the existence of living objects and their properties. The concept of natural selection must also be taught to be understood, but misconceptions persist, even after instruction. Researchers found the root of their perplexity in children; they have an innate, natural, intuitive, and unlearned tendency to reason about the world as biblical creationists do. Therefore, to avoid an ongoing impediment to scientific literacy, researchers suggest that educators challenge the reasoning of children as early as possible. A survey of the scientific evidence in the first part of the paper leads to another conclusion: creationist tendencies are inescapable; evolutionary education masks or suppresses rather than replaces them. The second part of the paper focuses on brain-based learning and education. The literature indicates that educators' conception of the brain also conflicts with children's understanding of human nature. Two ways to avoid this are discussed.

Keywords: Brain-based learning, children, creationism, education, evolution, explanations, natural selection, neuromyths, science, teleology

Introduction

It is well-known that Darwin's evolution story about common descent and natural selection conflicts with how biblical creationists understand the origin of life on earth and human beings (cf. Miller, Scott, and Okamoto 2006). Terry Mortenson (2009) has shown that the "order of creation in Genesis 1 contradicts the order of events in the evolution story in at least 30 points" (p. 176). What is less known is that repeated misconception of the concept of natural selection among high school students, undergraduates, and university educators is a troublesome problem for evolutionists (Bloom and Weisberg 2007; Kelemen 2012; Kelemen, Rottman, and Seston 2013). Not only must natural selection be effectively taught to be understood, but is also often misunderstood even after instruction (Anderson, Fisher, and Norman 2002; Cunningham and Wescott 2009; Kelemen 2012). Accordingly, the central question from a scientific research perspective is: How do unwarranted or non-scientific ideas about natural selection take root, and why are they resistant to change after instruction?

Research evidence indicates that the root of the problem for evolutionists is the inborn tendency of children to think and reason as creationists do—for example, in teleological, intentional, and essentialist categories. In the scientific literature these tendencies are referred to as "deep-seated cognitive tendencies" or "biases," as well as being basic, automatic, intuitive, natural, and unlearned tendencies (Emmons and Kelemen 2014; Kelemen 2012). Therefore, researchers suggest that evolutionists should make it their educational goal to challenge the creationist tendencies of children as early as possible. Otherwise the tendencies "creates a significant ongoing impediment to scientific literacy" that could persist into adulthood (Kelemen 2012, p. 72).

However, as we shall see, studies indicate that creationist tendencies are inescapable, even among educated undergraduate students, highly educated scientists, and people who have not been exposed to the content of Western evolutionary education. Also, contrary to what is generally assumed among educators, evolutionary education masks or suppresses people's natural conceptual understanding of the world rather than replacing it. Teleologically, things exist for a purpose; something does not come from nothing, and hence the function and purpose of everything that exists is explained by either the intentional design of persons or their inherent natures.

My aim in this paper is to show that evolutionary education conflicts with human nature. In the next section, I present a brief overview of four factors which could possibly explain why natural selection is persistently misunderstood, followed by scientific evidence indicating that children are creationists. I will then explore children's understanding of human nature. Scientific evidence indicates that children

are natural dualists; they think of people in terms of bodies and souls. By contrast, educators who follow the lead of neuroscientists inspired by materialism and biological reductionism, ascribe psychological attributes of a person to the brain, including the ability to learn. Two ways to avoid this are to clear-up the conceptual confusions and eliminate the neuromyths.

Children, Evolution and Creation

Misconception of natural selection

Deborah Kelemen (2012) identified and discussed four of the most important factors which could possibly explain the recurrent or persistent misconception of natural selection among students and educators, the fourth being the root of the perplexity of educators (cf. Lane, Wellman, and Evans 2010).

The first factor relates to the nature of the instruction students receive, together with the fact that educators themselves misunderstand the concept of natural selection. Consequently, they do not feel confident in their ability to teach it (Kelemen 2012, p. 72). However, a survey of the literature leads to another possibility: many teachers intuitively feel that something about the concept of natural selection is not right. Paul Bloom (2007) puts it as follows: "Natural selection is like quantum physics, then; we might intellectually grasp it, with considerable effort, but it will never feel right to us. When we see complex structure, we see it as the product of beliefs and goals and desires" (p. 150). Or, as he concluded elsewhere: "the real problem with natural selection is that it makes no intuitive sense" (Bloom 2005, p. 111). This same sense is expressed by those among the public who accept evolution but find natural selection a "mysterious process" (Bloom and Weisberg 2007, p. 996).

It seems reasonable to suggest that evolutionary education is counter-productive. What teachers and students do not understand, they are unable to explain, which explains the science failures of students.

The second factor compounds the first. The language used by educational experts and textbooks (i.e., the instructional material) is often teleological and anthropomorphic. Instead of explaining the existence or origins of natural objects and their properties as is normative among scientists—mechanically, in physical cause-effect terms—they tend to explain the origin of things by reference to their functions and purposes (Kelemen, Rottman, and Seston 2013, pp. 1074–1075). The problem evolutionists have with this approach is that it implies intentional design. For instance, the existence of a person explains both the origin of the existence and function of a chair (what it is *for*; its purpose or *telos*). When this same logic is applied to the universe and living things, it is labeled "unscientific." Problematic about anthropomorphism is that attributes of a person are erroneously ascribed to a mindless process. Consequently, natural selection is mistakenly thought of as a force that is able to think and act as a person. An example is Richard Dawkins. He teaches that "Natural selection is the blind watchmaker" that "designed" the human brain "specifically…to misunderstand Darwinism" (Dawkins 2006, pp. xix, 21).

Thus, teachers ask, how can they explain to their students the conclusion that a mindless force can design something, let alone explaining how a reptile can change into a fish and a fish into a bird? Dawkins' assertions are not only unintuitive and incoherent; they also betray a conceptual confusion. A brain, as opposed to a person, is unable to understand anything at all! (cf. Joubert 2014c).

A third explanation for the persistent misconception of natural selection relates to possible emotional reactions it could evoke in students who hold a particular set of religious beliefs. It suggests the possibility that beliefs about function and purpose are culture-specific effects caused by "unwarranted" ideas about divine creation and design. However, research indicates that this is not the case, as will be explained shortly. The evidence indicates that people untainted by Western-education think as creationists do, which leads directly to the fourth factor and the root of the perplexity of evolutionists.

Paul Bloom and Deena Weisberg (2007) state that resistance to scientific ideas (read, henceforth, "evolutionary ideas") "stem from two general facts about children, one having to do with what they know, and the other having to do with how they learn" (p. 996).

Children's teleological explanations

Characteristic of Western-educated adults is that they divide the world into living and non-living domains, sensitive to both their purposes and functions. Furthermore, they think of the properties of living things as self-serving (i.e., it is for their own good), and those of non-living things as other-serving (i.e., for the good of others). They are also careful to discriminate between kinds of non-living things and their properties (for example, craggy mountains provide animal habitat or natural defense). However, research data indicates that, although adults are able to explain how the properties of non-living things came to be in terms of the laws of physics, they are unable to provide reasons for why they exist (DiYanni and Kelemen 2005, p. 328).

In sharp contrast, until about nine years of age, children treat entities of all kinds as existing for a

purpose. Studies conducted among four- and five-year-old children show that they responded to "What is this for?" with answers such as noses are for smelling and holding up spectacles; mountains are for climbing; clouds are for raining; babies are for loving; and tigers are for walking around in the zoos for our pleasure (Kelemen 1999b, p. 464). Older children, seven- to ten-year olds, reasoned, for instance, that a "prehistoric" reptile has a long neck "so that it can catch fish," and a pointy rock "so that animals would not sit on it and smash it." Indirect evidence in support of the proposal that children are intuitive teleologists comes from how children reason about objects that could no longer perform certain activities. Young children view both artifacts and natural kinds that can no longer perform certain activities as needing to be repaired or replaced (DiYanni and Kelemen 2005).

Most revealing is that children's naming of objects is based on their intuitions about a creator's intent and how it relates to the design of an object. Children also categorize objects based on their "inductive beliefs about the nature of things" (Diesendruck, Markson, and Bloom 2003, p. 168). When three-year-old children were presented with a picture of a weasel, an otter, and a booby bird (it has webbed feet as does the otter), and asked whether the otter spends time on the land or in the water, it was found that they eschew overall similarity as a basis for judgment, attending instead to common functional parts. Despite the resemblance between the weasel and the otter, the children concluded that the otter "spends time in water" like the dissimilar booby bird with which it shares the functional property of webbed feet (Kelemen 1999b, p. 464). This is not unlike the conceptual reasoning of adults. When a woman is given a perfume and asked to find another of the same kind, knowledge about the function of perfume tell her that smell is relevant but the color, size, and shape of the bottle is not.

Susan Gelman and John Coley's (1990) research in children's ability to understand category membership led them to conclude that, contrary to what is generally assumed, two to three-year-old "children do not draw inferences blindly as a consequence of hearing the category label…[and] category membership can be more powerful than surface appearances….In sum, for children as young as age 2½, language conveys important information beyond that which meets the eye" (pp. 796, 803–804; see also Gelman 2004; Jaswal 2006).

Susan Gelman and Henry Wellmann's (1991) research provides further evidence indicating that children are not "externalists," which is contrary to the traditional assumption. Children "have an early disposition" to "firmly grasp" the non-obvious features of objects and realize their privileged status. By age three to four, children "reason clearly about the inside-outside distinction"; four-year-olds understand that babies and seeds have innate properties that are not apparent at birth but are inevitably manifested over time; and for four-year-old children, the inside of an object is often critical to the object's function and identity (whether it will be a watermelon or corn, whether it will have the physical features of a kangaroo or a goat [Gelman and Wellman 1991, pp. 213, 240–241]).

The point not to miss, however, is that their study shows that children have an innate ability to think logically and conceptually. If the concept of the nature (essence) of something carries with it the idea of a cause and characteristic tendency to grow and change in a particular way, then it follows, logically and conceptually, that it will be resistant to kinds of growth and change that are contrary to the thing's nature (for example, a kangaroo will not grow into a goat).

Other researchers found that children and many adults as well, assess the trustworthiness of their information sources when making judgments about the validity of the information. When, for instance, children are given a choice of information from both a child and an adult, they prefer to learn from the adult. Four- and five-year-olds know that adults know things that children do not. For example, "when 5-year-olds hear about a competition whose outcome was unclear, they are more likely to believe a person who claimed that he had lost the race (a statement that goes against his self-interest) than a person who claimed that he had won the race (a statement that goes with his self-interest)" (Bloom and Weisberg 2007, p. 997).

The findings are strikingly similar to the information represented in Genesis 1 and 2. When God created heaven and earth, no human person was present to observe it, yet the whole Bible is based on the trustworthiness of the Word of God, for He is "the God of truth" (Isaiah 65:16) and He "cannot lie" (Titus 1:2). Moreover, God brought to Adam various creatures of the field and of the sky, which God created to reproduce "according to its kind," "to see what he would call them. And whatever Adam called each living creature, that was its name" (Genesis 2:19). The context suggests that Adam not only understood the intent of the Creator, but also that the Creator, by having not corrected Adam's naming of them, was satisfied that Adam understood the properties of those animals.

Nevertheless, we also have reasons to believe that God brought the animals to Adam in order to make him realize that his life-companion is not to be sought among them. When Adam saw the woman

God brought to him, he immediately recognized that "She's my kind. She is not only human, she's also lovable!" (Genesis 2:23; personal paraphrase). He then named her Eve, because she was the mother of all mankind (Genesis 3:20).

The question now is, if young children are intuitive and indiscriminative teleologists, where does that intuition originate from?

Explanations for the intuitions of children

Deborah Kelemen considers the view that children possess an innate cognitive tendency to explain things in terms of their function or purpose. In this view, the tendency becomes refined over the course of the child's development via learning. However, considered from an evolutionary perspective, this possibility is difficult to comprehend. What possible adaptive advantage could cause humans to evolve an innate or natural tendency to view objects as "designed for a purpose?" (Kelemen 1999b, p. 464).

Considered from a biblical-creationist perspective, it is easy to explain. For example, God created the sun and moon to, respectively, "rule the day" and "rule the night" (Genesis 1:16–17); He formed the earth "to be inhabited" (Isaiah 45:18), and He created man to "have dominion over the works" of His hands (Psalm 8:4, 6).

By contrast, evolutionists reason that

- Biology is the study of complicated things that give the appearance of having been designed for a purpose…. Natural selection, the blind, unconscious, automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind. (Dawkins 2006, pp. 1, 5)
- Although many details remain to be worked out, it is already evident that all the objective phenomena of the complete history of life can be explained by purely naturalistic or, in a proper sense of the sometimes abused word, materialistic factors…Man is the result of a purposeless and natural process that did not have him in mind. (Simpson 1967, p. 344)

The main problem is a mindless process can never have anything in mind!

Kelemen considers another possibility which could explain the creationist tendencies of children: humans find purpose-based explanations compelling because teleological reasoning "comes easily to us"; the "tendency to generate intention-based teleological explanations is a fundamental human propensity"—one that "remains a default throughout development" (Kelemen 1999a, p. 1449; see also Bloom 2007, p. 150; Kelemen 1999b, p. 466). The evidence that humans have an inborn ability to attribute purpose to the minds of agents is documented in infant studies.

Within the first nine to 18 months of life, infants demonstrate an increasing understanding of the fact that agents act on the basis of goals; they can predict the outcome of the goal-directed actions of others; and they can generate expectations of the movements of others. By 13 to 18 months of age they display an understanding of how familiar and unfamiliar objects can be used to achieve goals. These examples indicate that children from a very young age understand that "objects exist in the world to fulfill the purposes of agents" (Kelemen 1999b, p. 466).

Put differently, young children comprehend that natural objects and artifacts exist in the world because someone (an intentional agent) put them there for a purpose. To put it in yet another way, young children have a built-in ability to ascribe purposes to either a designer or a user: "The agent who typically interprets and actualizes the intentions of the designer" (Kelemen 1999b, p. 467). However, Kelemen concludes that statements such as "hearts are for pumping blood" are scientifically permissible to evolutionary scientists because such statements do not attribute agency to either the heart or to a putative intentional person.

But Kelemen (1999a) also draws the attention of her readers to historical evidence which indicates that Western adults used teleological explanations to account for the existence of objects in the world up until Darwinism dominated people's thinking and reasoning. People not only accepted that eyes and ears have been created by God for a purpose, but also extended it to other natural objects. But, she adds, because science became separated from theology during the Enlightenment, or as a consequence thereof, does not mean that those beliefs no longer have any influence in cultures where evolutionary explanations are not well diffused.

In one study, documented by Kelemen (1999a, p. 1449), U.S. children from both Christian and non-Christian backgrounds were presented with different causal accounts for the origins of natural objects. It was found that, irrespective of parental background, six- to eight-year-olds strongly endorsed the view that they "were made by God." Margaret Evans (2000a, 2000b, 2001) found similar results. When questions like, "How do you think the very first bear got here on earth?," eight- to ten-year-old children favored creationist accounts. The same preference was also found among five- to seven-year-olds' agreement ratings for animate and inanimate objects. It was only the 11- to 13-year-old "nonfundamentalist" children who diverged from the theist position (Evans 2001). The explanation for the change is straightforward: it is from this age that children are exposed to the evolution story in greater depth.

Another study of four- to nine-year-olds found that, regardless of "how their intuitions were probed in the study, a significant proportion of the children posited God, rather than any natural process, as the underlying cause of a variety of natural phenomena" (Kelemen 1999a, p. 1449). Kelemen concluded her research article with the following observation of Richard Dawkins (1995): "We humans have purpose on the brain. We find it hard to look at anything without wondering what it is 'for,' what the motive for it is, or the purpose behind it" (p. 96; Kelemen 1999a, pp. 1449–1450). Setting aside Dawkins' confusing words about "purpose on the brain," what is evident is his acknowledgment of what comes naturally to human beings. It is inescapable, and socialization (parental influence or religious exposure) has little effect on how young children think about the origin of living and non-living objects and their purposes.

Some reason that this conclusion attributes too much to children, arguing that it is obvious that religious beliefs, such as the entry of sin into the world in the Garden of Eden (Genesis 3), are entirely learned. Some argue that all religious beliefs are entirely learned, "including dualism and creationism." However, the developmental research "suggests that this is not the case" (Bloom 2007, p. 150).

Children are creationists

Kelemen's (2004) extensive and detailed review of the cognitive development research data on children's concepts of agency, imaginary companions, and understanding of artifacts suggests that by age ten

> children's explanatory approach may be accurately characterized as intuitive theism—a characterization that has broad relevance…to science educators because the implication is that children's science failures may, in part, result from inherent conflicts between intuitive ideas and the basic tenets of contemporary scientific thought. (Kelemen 2004, p. 299)

What is astonishing is, while the researcher is well aware of what "comes naturally to us" and even acknowledges the source of children's science failures, she thinks the problem is human nature, and not the possibility that there is something inherently wrong with the evolution story. In fact, the reader will seek in vain for discussions of that possibility in the literature documented in the present paper.

Because children are able to consider objects as products of design does not mean there is a connection about this ability and God as their explanation of origins. Like some adults, children are able to view supernatural agents as originators of nature but explain functions in terms of non-intentional causes, such as evolution. However, a study of six- to ten-year-old British children found that children identified people as the designing agents of artifacts, and God as the designing agent of nature (Kelemen 2004, p. 299; Kelemen and DiYanni 2005).

To appreciate this finding, one has to realize, compared to 79% of U.S. adults (18–34 years) who identified themselves as having some religious convictions, the same is only true of 25% of British adults (same age group). Even if British adults offer a religious affiliation when asked, 42% label themselves as non-religious. Taken together, these studies provide "good preliminary evidence against the notion that ambient religious representations cause children to develop a purpose bias" (Kelemen 2012, p. 76; Bloom 2007).

Another noteworthy point in Kelemen's (2004) paper is that, although the question "are children intuitive theists?" suggests a dichotomy between child and adult reasoning, it would be wrong to conclude that it is the case. The research evidence indicates, rather than being a product of socialization, children think as creationists do because it is the default human cognitive tendency that could continue throughout life, "even as other explanations are elaborated" (p. 299). Bloom (2005) is more to the point: "Creationism—and belief in God—is bred in the bone" (p. 112).

These conclusions also contrast sharply with an alternative proposal: children undergo conceptual change "revised and replaced by a physical-reductionist view of nature in cultures endorsing such ideas" (Kelemen 2004, p. 299). The evidence indicates that contemporary adults are surprisingly deficient in reasoning in non-teleological physical-reductionist terms, and natural selection is persistently misconstrued as a purposive, designing force; therefore, "science educations suppress rather than replace teleological explanatory tendencies" (Kelemen 2004, p. 300).

In order to further explore whether children's intuitive teleological tendencies occur as a function of age, development, or reading scientific literature, Krista Casler and Deborah Kelemen conducted a study among Romanian Romani adults, otherwise known as gypsies. Nonschooled Romani people, untainted by evolutionary education have the same teleological intuitions as scientifically "naïve" British and American elementary school children (Casler and Kelemen 2008, pp. 340–359). Furthermore, their findings challenge assumptions of fundamental conceptual change over development or discontinuities between children and adults.

Kelemen's suggestion that physical-causal explanations, which take center stage in Western education, suppress rather than replace children's default, intuitive teleological explanations is remarkably consistent with studies conducted among adults.

Adults and teleological explanations

Researchers on child-appropriate assessments found that educated elderly Alzheimer's patients differ from healthy elderly and young adult controls by accepting and preferring teleological explanations of natural phenomena (Lombrozo, Kelemen, and Zaitchik 2007). The authors conclude: "Recognizing the developmental continuity of a preference for teleological explanation can help scientists understand public issues such as the appeal of creationism, and inform educational efforts about topics such as evolution" (Lombrozo, Kelemen, and Zaitchik, p. 1005).

Their conclusion might suggest that: 1) adults who are creationists are, just like children: ignorant; 2) children and adults who are creationists are, like Alzheimer's patients, suffering from a brain disease; or 3) creationism is a kind of disease to which evolution and physical-causal explanations are the antidotes. But what happens when educated undergraduates and highly educated scientists are subjected to the same scientific research methodologies and reason as creationists are?

To test whether people ever outgrow "fanciful purpose-based ideas," whether teleological explanations may be "a passing stage of maturity," and to further explore the possibility that evolutionary education actually suppresses rather than replaces children's intuitive reasoning about the world, Deborah Kelemen and Evelyn Rosset (2009) conducted two studies among undergraduate students. Both studies used child-appropriate assessments, and both studies indicate that, even after completing multiple college level science courses, adults retain teleological explanations of natural phenomena.

Most striking, the authors noted, is how strongly such "non-scientific beliefs" are held: "Explicit Belief items were endorsed over 70% of the time" (Kelemen and Rosset 2009, p. 141). The conclusions of the authors were significant: "teleological explanation is maintained as an explanatory default throughout development—one suppressed rather than replaced by the acquisition of scientifically warranted explanations" (p. 142); and "The source of popular resistance to scientific ideas appears to run deep" (p. 143).

Deborah Kelemen, Joshua Rottman, and Rebecca Seston (2013) conducted almost the exactly the same study among physical scientists. Their core research question was whether teleological explanations can ever be escaped. The authors concluded that

> specialized scientific training and substantial knowledge base [of scientists] does no more to ameliorate their unwarranted teleological ideas than an extended humanities education. This suggests that there is a threshold to the conceptual revision of teleological ideas—one that even accomplished physical scientists do not breach. A broad teleological tendency therefore appears to be a robust, resilient, and developmentally enduring feature of the human mind that arises early in life and gets masked rather than replaced, even in those whose scientific expertise and explicit metaphysical commitments seem most likely to counteract it. (Kelemen, Rottman, and Seston 2013, p. 1081)

They conclude their research paper by noting: "The enduring effects of the human teleological bias on science and culture may be more profound than we realize" (Kelemen, Rottman, and Seston 2013, p. 1081). Indeed, it is, because teleological reasoning "is bred in the bone," and evolutionary education (not science!) conflicts with human nature.

Another study was prompted by the following question: "When students learn scientific theories that conflict with their earlier, naïve theories, what happens to the earlier theories?" (Shtulman and Valcarcel 2012). The researchers investigated this question among what they referred to as "Adults with many years of science education" (p. 209). What is particularly interesting about the study is that the researchers tested participants across ten domains of knowledge: astronomy, evolution, fractions, genetics, germs, matter, mechanics, physiology, thermodynamics, and waves, and found

> that naïve theories are *suppressed* by scientific theories but not *supplanted* by them.…This effect was observed not only in domains where participants were introduced to the correct, scientific concepts in late adolescence but also in domains where they were introduced to those concepts in early childhood. (Shtulman and Valcarcel 2012, p. 213)

Discussion

The research literature documented above represents the tip of the iceberg, but it suffices to show that research conducted over the last 30 years consistently yields the same results: a teleological explanation of natural objects and their properties comes naturally to people, but is often masked or suppressed by evolutionary education. The irony is, instead of realizing that evolutionary education conflicts with human nature, educators believe that human nature conflicts with evolutionary education. Therefore, they believe that more of the same will solve the persistent misconception of natural selection.

Some researchers explored the hypothesis that acceptance of evolution is related to students' insufficient knowledge of the nature of science, scientific methodologies, and scientific theories (Lombrozo, Thanukos, and Weisberg 2009). It is difficult to support that hypothesis when scientists are

teaching things most people would find unintelligible and impossible to believe.

According to Eric Kandel, a Nobel laureate, and his colleagues, "Colors, sounds, smells and tastes are mental constructions created in the brain by sensory processing. They do not exist, as such, outside the brain" (Kandel, Schwartz, and Jessell 1995, p. 370).[1] Firstly, if colors and smells only exist in brains, and people see red objects and smell rotten things all the time, then, logically, they must be able not only to see into their brains but also to smell odours in their brains. But since people are unable to do that, colors and odors must be real things and, therefore, exist in the world outside their brains. Secondly, it is not, and it has never been a scientific theory that colors, sounds, smells, and tastes do no exist. It is an assumption that has it roots in the Greek materialists and atomists, such as Democritus. And thirdly, no scientific experiment could show that everything people see as colored is colorless, or that nothing has either smell or taste. Therefore, if what scientists are telling people about their senses is true, then they are living an illusion, and hence, have no reason to trust their senses as sources of knowledge about the world—and that is absurd.

Kevin Dunbar and Courtney Stein (2007; cf. Masson et al. 2012), seem to believe that they have found the cause of the perplexity of evolutionary educationists with the brain. One of their key "findings," based on experiments involving brain imaging, is that learning does not easily occur when people are provided with information that is inconsistent with their "preferred theory" of the world (Dunbar and Stein 2007, p. 199). If it is true, then it cannot be a discovery based on brain research. Richard Dawkins (2006), for example, informs his readers that even if there is no actual evidence to support Darwinism "we should still be justified in preferring it over all rival theories" (p. 287). The rationale for his anti-scientific posture is quite clear: "Darwin made it possible to be an intellectually fulfilled atheist" (p. 6).

More telling are the statements of geneticist Richard Lewontin:

> Our willingness to accept scientific claims that are against common sense is the key to an understanding of the real struggle between [evolutionary and materialist] science and the supernatural. We take the side of science *in spite* of the patent absurdity of some of its constructs, *in spite* of its failure to fulfil many of its extravagant promises of health and life, *in spite* of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to naturalism. It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our *a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door. (Lewontin 1997, p. 9)

The statements from Kandel and his colleagues, Dawkins and Lewontin suggest that educators are misguided to think that the cause of students' persistent misconception of natural selection is the brain or ignorance. It is confusion which results from education based on a commitment to evolution, materialism, and atheism.

When people are confused, more of the same information will only confuse them further. What is required is something different: information students can naturally assimilate, understand, and explain. Instead of building on what children already have—their natural ability to explain objects and their properties in terms of their purposes and intentional agents, and refining this ability, it is seen from the perspective of evolutionary education as due to something which students lack, namely, knowledge.

Creationism does not have to be taught to be understood, because creationism and belief in God "is bred in the bone." The same is true of the other innate abilities of children. For instance, children have the innate ability to speak, but we do not mask or suppress this ability. Rather, we refine it by teaching them to use language properly. These truths are expressed in the following statements by physics professor Alan Sokal, and theoretical physics professor Jean Bricmont:

> For us, the scientific method is not radically different from the rational attitude in everyday life or in other domains of human knowledge. Historians, detectives and plumbers—indeed, all human beings—use the same basic methods of induction, deduction and assessment of evidence as do physicists and biochemists…[T]hey often conflict with 'common sense.' But the conflict is at the level of conclusions, not the basic approach. (Sokal and Bricmont 2003, p. 54)

The fact is the same cannot be said about evolutionary education. It is radically opposed to

[1] Others echo the same confusions. Dawkins (2006) writes: "The reason the sensation of seeing is so different from the sensation of hearing and the sensation of smelling is that the brain finds it convenient to use different kinds of internal model of the visual world, the world of sound and the world of smell (p. 34). "In perception, what the brain learns is usually about the outside world. This is why what we see appears to be located outside us, although the neurons that do the seeing are inside the head" (Crick 1994, p. 104). These are expressions of confused metaphysics. It is a person who sees, hears, and smells.

people's natural and everyday teleological reasoning about the reasons things exist and how they came to be. That ordinary people, as well as highly educated scientists, commonly explain things in teleological terms is no coincidence. The Creator created human persons in His image and likeness (cf. Genesis 1:26–27; 2:7; 5:1–2). It is, therefore, understandable why natural selection as an explanatory mechanism for molecules-to-man evolution conflicts with human nature.

I agree with evolutionary researchers who conclude that teleological, intentional, and essentialist biases are the everyday intuitive reasoning of people; but strongly disagree with their conclusion that the everyday, natural reasoning of people, and specifically of children, serves as an impediment to scientific literacy. In fact, evolutionary education is an impediment to natural human development.

Given this conclusion, the question I now wish to explore is: Could brain-based learning and education have the same effect on children's natural understanding of human nature as natural selection on their conceptual understanding of phenomena in the world?

Brain-Based Learning

The past 15 years have seen a growing interest in the brain, and an increasing belief among educators that education can benefit from neuroscientific insights into how children develop and learn. As Paul Howard-Jones (2008) indicated, initiatives have gone by various names: "Brain, Mind and Education," "Neuroeducation," "Educational Neuroscience," and "Brain and Education." They all share one common goal: "to combine our educational understanding with our biological understanding of brain function and learning" (p. 361). Howard-Jones adds that although interest in the brain may be blossoming in education, "several challenges await those wishing to venture there and some of these are of a fundamental and philosophical nature" (p. 362).

In the remainder of this section, I will present the scientific evidence that indicates children are natural dualists. I will then focus on two core neuromyths: 1) children's everyday conceptual understanding of themselves, others, and the world, often contemptuously referred to as "folk psychology," is not a theory; and 2) the brain is not capable of learning; a person is. The latter is a conceptual weed that must be uprooted. I will conclude with an overview of a recent study conducted among teachers in the UK and the Netherlands. Contrary to what is generally assumed, possessing greater knowledge of the brain does not protect teachers from acquiring misinformation.

Children are soul-body dualists

Bloom and Weisberg's (2007) review of evidence from developmental psychology led them to suggest that part of the "resistance to scientific ideas is a human universal," and, as was noted, the resistance follows from two general facts about children, one having to do with what they know and the other having to do with how they learn (Bloom and Weisberg 2007, p. 996). Babies, for example, know that objects are solid, they persist over time even when out of sight, they fall to the ground when unsupported, and do not move unless acted upon. Bloom and Weisberg also state that "people's commonsense psychology is dualism, the belief that the mind is fundamentally different from the brain. This belief comes natural to children" (Bloom and Weisberg 2007; see also Bloom 2005, 2007, p. 149). By contrast, "materialism is not common sense. Like quantum physics and natural selection, it is a bizarre and unnatural view. We are intuitive dualists" (Bloom 2006, p. 213).

For instance, preschool children will claim that the human brain is involved in some aspects of a person's mental life, such as solving math problems, but they will deny that the brain can pretend to be a kangaroo, can love one's brother, or brush one's teeth. When told about a brain being transplanted from a boy to a pig, they believe that we will get a very smart pig as well as one with pig beliefs and pig desires. "For young children, then, much of mental life is not linked to the brain" (Bloom and Weisberg 2007, p. 996).

The most striking demonstration of dualism concerns the development of children's afterlife beliefs. Jesse Bering and David Bjorklund (2004) presented to children of various ages stories about a mouse that died, and asked them questions about the persistence of certain properties. By preschool age, the researchers concluded, "children appear fully appreciative of the fact that, once death is certain, those activities and physical processes essential to the physical maintenance of all organisms cease.... Children understand that, unlike sleep, biological processes no longer apply to death" (Bering and Bjorklund 2004, p. 229).

Important is the fact that "children's beliefs are characterized by a highly typical complexion; that of a knowing, believing, *mindful* spirit that has shed its biology proper" (p. 230). Bloom's interpretation of the research data led him to say that "the notion that consciousness is separable from the body is not learned at all; it comes for free" (Bloom 2007, p. 149).

Bering's (2006) research of children's conceptions of the afterlife and closely supernatural beliefs led him to the same conclusions as those reached by Bloom and Weisberg: "By stating that psychological states survive death, one is committing to a radical form of mind-body dualism," which he referred to as the "folk

psychology of souls" (Bering 2006, p. 453). But, in contrast to Bloom and Weisberg (2007), who conclude that children's "intuitive beliefs about the immaterial nature of the soul and the purposeful design of humans" clashes with scientific concepts because they are unnatural and unintuitive (p. 997), Bering proposes an alternative hypothesis, and refers to it as his "central thesis." The thesis is that natural selection created a "cognitive 'system' [in the brain] dedicated to forming illusionary representations of psychological immortality, the intelligent design of the self, and the symbolic meaning of natural events" (pp. 454, 461).

Again, natural selection is anthropomorphized, which wrongly suggests that an unconscious and mindless process or force is able to create something. And as I have pointed out elsewhere (Joubert 2014c), the brain is also unable to represent anything. A ring in the trunk of a tree represents the age of the tree; a photo represents grandma, and a person represents thoughts, beliefs, and desires by means of gestures, symbols, words, and sentences. Bering's thesis can only be true for those who decided there is no room in their worldview for immaterial spirit entities, such as God, angels, and human and animal souls.

Let me summarize the scientific evidence that children are natural dualists in the words of Emmons and Kelemen:

> Collectively, available findings on afterlife reasoning therefore indicate that from a young age, individuals are prone to reason that persons continue to exist despite the dramatic biological changes associated with death. Furthermore, the essence of personhood appears to be mentality: Persons' mental aspects rather than their bodily aspects are conceptualized as persisting once the physical body is destroyed. (Emmons and Kelemen 2014, p. 2)

To biblical creationists the scientific data are strikingly consistent with what the Bible teaches about both the soul and the afterlife (Genesis 35:18; 1 Kings 17:17–21; Psalm 31:9; Ecclesiastes 12:7; Micah 6:7; Matthew 10:28, 22:23–32; 1 Corinthians 15; 2 Corinthians 5:1–10; Philippians 1:21–24; James 2:26; 2 Peter 1:13–14; Revelation 6:9–11). Compare now what children know about themselves and other people with the following assertions:

- Bit by experimental bit, neuroscience is morphing our conception understanding of what we are. The weight of evidence now implies that it is the brain, rather than some nonphysical stuff, that feels, thinks, and decides. That means there is no soul to fall in love…it means that there is no soul to spend its postmortem eternity blissful in Heaven or miserable in Hell. (Churchland 2002, p. 1)
- Even though its [*sic*] common knowledge these days, it never ceases to amaze me that all the richness of our mental life—all our feelings, our emotions, our thoughts, our ambitions, our love life, our religious sentiments and even what each of us regards as his own private intimate self—is simply the activity of these specks of jelly in your head, in your brain. There is nothing else. (Ramachandran 2003)

These assertions are expressions of private beliefs and are not formed on the basis of scientific research data. Ramachandran assumes that everybody believes the same thing: there is no self, just a brain, and "There is nothing else." However, his reference to "common knowledge" is contrary to what child developmental and cognitive researchers discovered about the everyday, commonsense psychology of people; it is contrary to what the Bible teaches; and it goes against what physicalist philosophers acknowledge about themselves and other people.

Jaegwon Kim writes:

> We commonly think that we, as persons, have both a mental and a bodily dimension…Something like this dualism of personhood, I believe, is common lore shared across most cultures and religious traditions…It is often part of this "folk dualism" that we are able to survive bodily deaths, as "pure spirits", and retain all or most of the spiritual aspects of ourselves after our bodies are gone. (Kim 2003, p. 65)

David Papineau admits that physicalists cannot help but think in dualist terms:

> Indeed I would say that there is a sense in which even professed philosophical physicalists, including myself, cannot fully free themselves from this intuition of distinctness. Of course, we deny dualism in our writings, and take the theoretical arguments against it to be compelling. But when we aren't concentrating, we slip back into thinking of conscious feeling as something extra to the brain. (Papineau 2008, p. 57)

The problem is these learned adults cannot allow their intuitive knowledge and understanding of themselves to be integrated into their interpretation of scientific research results because to think that the mind or soul is separable or metaphysically distinct from the brain "is inconsistent with modern philosophical and neuroscientific views" (Stein et al. 2010, p. 1760). Therefore, in the words of atheist and philosopher of science, Daniel Dennett (1991), "dualism is to be avoided at all costs" (p. 37). Dualism has to be avoided because Darwinism demands atheism (Bergman 2010). To those who think that Darwin made it possible to be an intellectually fulfilled atheist thoughts of an afterlife, the immortality of the soul, and creationism are psychologically disturbing (Joubert 2012, 2014a).

There are, therefore, sufficient reasons to be concerned that the beliefs of proponents of naturalism and physicalism underlie and inform brain-based learning and education.

Conceptual confusion and neuromyths

It has been noted that children do not revise or replace their natural conceptual understanding of the world with physical-reductionist explanations of the world (Kelemen 2004, p. 299). We have also seen repeated use of terms such as "intuitive," "natural," and "naïve theories." The scientific literature also includes regular references to children's "folk biology," "folk physics," and "folk psychology." There is also formal academic material on themes such as the "folk psychology of free will" (Nichols 2004), and the "folk psychology of morality" (Guglielmo, Monroe, and Malle 2009).

Underlying the use of that terminology are two general assumptions. Firstly, people's everyday commonsense or folk conceptual framework consists of tacit theories they use to interpret, understand, and explain the world and human behavior. For instance, "beliefs, desires and other commonsense mental states are posits of a folk theory of mind" (Stich and Ravenscroft 1993, p. 10).[2] Secondly, these "naïve theories" might be abandoned if any of these theories are found defective (Stich and Ravenscroft 1993). The problem is that both assumptions are misguided, for at least three reasons (cf. Hacker 2010, p. 5).

First, scientific methodologies involve empirical observation of phenomena which leads to an explanatory theory, as well as hypotheses, abstraction, generalization from observed data, and confirmation and disconfirmation of results. In this sense, children's everyday conceptual explanation of phenomena cannot be a theory. Furthermore, if a theory is falsified, theoretical concepts can be discarded with the theory to which they belong. But from the fact that scientists use theoretical concepts to explain certain phenomena, for example, fractals in chaos theory, it does not follow that all explanations are theoretical.

Second, people's psychological concepts of themselves and other persons, such as of the soul, mind, "heart," consciousness, awareness, conscience, perception, sensation, thought, reason, judgment, discernment, knowledge, understanding, belief, imagination, desire, will, intention, choice, decision, attitude, emotion, feeling, purpose, goal, character, virtue, praise, blame, and body are not theoretical concepts. They cannot be abandoned if chaos theory is proven wrong. These are concepts people use everyday, atheoretically, to describe the phenomena they encounter in the world, and are used in all scientific disciplines. But it would be a mistake to think that describing phenomena is their sole role for language-users.

Third, and most importantly, we use psychological concepts to shape human nature; we use them to give shape to our own and other people's subjective experiences; and by their use, we give expression to our experiences from a first-person, self-conscious, self-knowing perspective. It follows that children, in learning the meaning of psychological concepts, are not learning a theory of anything. By learning the meaning of these concepts, the child is learning new behavior; the learning child learns to describe and explain in these terms. Hence, to learn to give an explanation by using psychological concepts correctly is to learn to be a rational human being.

It is, therefore, misleading to write that developmental research "suggests that children's broad teleological ideas do not simply arise because of a basic, atheoretical tendency to categorize objects by reference to useful goals. Rather, there is evidence to suggest that they stem from a theoretically deeper strategy informed, in part, by their understanding of design and purpose in the artifact domain" (Kelemen 2012, p. 19).

What, we may ask, is theoretical about a child watching his father using a hammer to drive a nail into a piece of wood? What is theoretical about watching someone scratching his leg? "He scratches his leg because it was itching" explains his behavior teleologically rather than causally—the purpose was to alleviate the itching. I suspect that it is "theoretical" for the ill-conceived reasons already mentioned, chief of which is the assumption that people's everyday psychological concepts are tacit theories that can or should be revised and replaced by scientific concepts and theories informed by the evolution story. It is not a matter of theories, but of logic and proper conceptual understanding of phenomena.

Since the "Decade of the Brain" in the 1990s, it has become increasingly popular to attribute psychological properties to the physical brain: the brain thinks, reasons, feels, form beliefs, and hypotheses, represents objects, has desires, knows, designs computers, stores information, and makes decisions. And books such as *The Learning Brain: Lessons for Education* (Blakemore and Frith 2005a), conferences on themes such as How the Brain Learns: What Lessons are there for Teaching? (ACER 2013),[3] and scientific papers with titles such as *The Radical Plasticity Thesis: How the Brain Learns to be Conscious* (Cleeremans 2011) have helped to foster

[2] Wellman and Lagattuta (2004) express the confusion this way: "Indeed…our everyday, folk psychology is an everyday theory about people and minds—hence the phrase 'theory of mind.' Theories explain phenomena: an everyday theory of mind, therefore, is driven by explanation" (p. 481).

[3] Bruno della Chiesa of Harvard Graduate School of Education, who attended the conference, writes confusingly that "Understanding (and thus, in my view, learning) is an intense pleasure for the human brain, particularly in children" (ACER 2013, p. 3). He leaves his readers with the following incoherent conclusion: a brain, as opposed to a child, is able to describe the quality of learning experiences as pleasant or unpleasant, agreeable (enjoyable) or disagreeable, wonderful or dreadful, interesting or boring, delightful or revolting.

the unintelligible and incoherent idea that a brain of a person is the thing that learns.

Uta Frith (2013), a leading proponent of brain-based learning and professor at University College London, not only believes the brain is able to learn but also believes that the brain is "continuously" taking "account of the environment" (p. 6). A commonsense question is: If your brain is doing that, what are you doing? And if your brain takes account of the environment, how would you know what its recount of the environment is, given that you have no access to your brain and are unable to communicate with it?

The brain is not a learner

For learning to take place there has to be a learner, and in order to learn, the learner must have the ability to learn. Now children (and adults) learn from others (those who have already learned) by watching and listening to them. In precisely what sense of the words "watch" and "listen" can watch and listen be predicated of a brain when a brain has no sense organs?

Some educators assert that a brain's "capacity to adapt to continually changing circumstances — depends critically on how much it is used" (Blakemore and Frith 2005b, p. 460). It is an extremely misleading statement, for students are unable to use their brains the way they use their hands, feet, or an instrument, such as a ruler. The fact is, a teacher cannot expect or ask students to use their brains at all. What a teacher can do is to ask or order students to use, for example, their ears to detect a particular sound, to bring their eyes closer to the binoculars or to move them in the direction of an approaching object; and the teacher can ask or order them to use their left hands to write their names on a piece of paper. But a brain is unable to do that. The point is simple: these organs are under the direct and voluntary control of the student, but the brain of the student is not. Likewise, students who find themselves in a disorderly situation can say to either themselves or to each other "Now is the time to exercise self-control," but students can neither say that to their brains nor to the brains of others. A brain has no ears to hear and no capacity to listen (i.e., to comply with a request or obey, or disobey, an order).

It is, therefore, a dire error to state that "the brain has evolved to educate and to be educated…[Our book] focuses on learning in the brain at all ages" (Blakemore and Frith 2005b, p. 459). Firstly, at minimum, to educate (teach) and to be educated (to learn) involve perceptual consciousness in the form of hearing, seeing, smelling, tasting, or tactilely feeling something. Secondly, a child learns almost anywhere, when given the opportunity to do so: in bed, in a study, in a classroom, in a library, in a swimming pool, in a shopping-mall, in a car, in an airplane, in a bush, or in a tree. These are all places where the child using his senses can be located. But learning in a brain, which is in a skull, can never be one of them.

And thirdly, to assert that the brain has evolved to educate and to be educated suggests that, somewhere along the evolutionary path from particles-to-humans, a nervous system mysteriously popped into existence, and man became a rational and moral being. The fact is the only creature on earth that has knowledge of good and evil is man (cf. Genesis 3:1–7, 22). It presupposes self-consciousness; consciousness of one's own character qualities, virtues and vices, or folly. Moreover, man has a conscience, which explains his emotions of moral self-assessment, such as shame, guilt, and remorse; and none of that can be predicated of a brain (see Joubert 2014a, 2014b).

There are various ways a student can be punished for repeated failures to do his schoolwork. How should the teacher punish a brain, if the brain is a thing that learns? How could, or better, should he teach a brain to learn to accept responsibility for (its) behavior? To teach a student to accept responsibility is to develop one of his core abilities, namely, to learn to give an account of his behavior. Thus, by providing others with reasons for his behavior, the student provides others with a particular way of understanding it. He is, therefore, subject to criticism if the reasons he offers for his actions fail to support them. By contrast, a brain cannot answer questions, and it is unable to behave either responsibly or irresponsibly. Brains only function and malfunction, as do hearts, kidneys, and livers.

It is also misleading to suppose that "each one of us is a machine" (Dawkins 2006, p. 3) or that "the brain is a causal machine" (Churchland 2005).[4] It

[4] If Dawkins and Churchland mean that the human body and brain are the causal conditions necessary for us to interact with the world, for doing things, and for making things happen in the world, then we can agree. But that is not what they have in mind. In the words of Dawkins (2006), "The body is a complex thing with many constituent parts, and to understand its behaviour you must apply the laws of physics to its parts, not to the whole.…The laws of physics are being obeyed within every cell of the muscles" (pp. 10, 11). The problem is that in their view causal relations are necessary relations between events; but it is not, even if the antecedent event makes the consequent event happen by doing something to it. The reason is because events are not agents and do not act on each other. In other words, their view of human action reduces teleological explanations in terms of reasons and purposes to causal explanations. And goals at which an agent aims are transformed into causally efficacious mental states (i.e., desires and beliefs). Desires and beliefs, in turn, are seen as identical to states of the brain, which cause muscle contractions that must be explained. But that is mistaken. If I cause my hand to go up, then it is not my believing something that is the cause; it is what I believe—namely, if they see my hand they will register my vote. Moreover, believing something could never be a brain or neural state, since a neural state cannot have the consequences of a good or bad and true or false belief. The only thing that neural states and events could explain is the movements consequent upon muscular contractions, not actions. Therefore, a neuroscientist may offer a neurophysiological explanation of the somatic events necessary for a person to move his fingers, but it would be far from an explanation for why the person is playing the guitar.

wrongfully suggests the idea that all behavior is a reflection of brain function, or when a child reflects on the reasons for or against doing something, he is not reflecting on what reason dictates, but on what will cause him to do it.[5] However, in recounting for what reason he did what he did, the child is not describing or explaining what caused him to do what he did, but what his reason (rationale) for acting was. The important point is, a person's reasons can be good or bad, selfless or selfish, moral or immoral; reasons may also be convincing, defensible, weighty, compelling, persuasive, weak, and unacceptable, but brain causes can be none of these.

Furthermore, a child visits an ostrich farm in order to learn about the behavior of ostriches, but in order to learn ostrich behavior cannot be a cause of the child going to the ostrich farm; and a child's reason for writing "144" in a questionnaire is because 12×12=144. It indicates that the child learned his multiplication tables. It is for this reason (not cause!) that we say that a person has a reason for doing something but cannot have a cause for doing it. We can, therefore, understand that a child can play chess because he learned to play chess, and not because he was caused to play chess. If we are puzzled by his gambit, we want an explanation of his move, not of his movement. Neural events in the brain may explain how it is that the child is able to move his hand, but neural events in his brain cannot explain his move. Only the principles of chess strategy that the child has learned and was aware of at the time of his move can do that. And the brain is neither conscious or unconscious nor aware or unaware of anything.

The last point is contrary to Alex Cleeremans' (2011) claim that the "brain learns to be conscious" (p. 1). He calls it his "Radical Plasticity Theory," which, he says, "is the brain's (emphatically non-conceptual) theory about itself" (p. 4). There are several problems with Cleeremans' metaphysics and understanding of consciousness.

For one thing, there is no such thing as a non-conceptual theory about anything. For another, consciousness is a precondition for being able to theorize about or learn anything at all. A person without consciousness is either anaesthetized, has fainted, or has fallen asleep. The anaesthetized person and a person who fainted can regain or recover consciousness, and the person who has fallen asleep can later awake. A brain is unable to collapse since it cannot faint; it is not a person who can stand up, look around, request support, and ask for water to drink.

Consciousness is also not a theory, let alone a "brain's non-conceptual theory about itself." A person, however, is able to theorize about the nature of consciousness. Consciousness, as noted in the previous paragraph, is a state of being awake (as opposed to being asleep and unconscious), and a person is, therefore, conscious of objects and phenomena in the person's perceptual field if it has caught and held the attention of the person. For instance, a person can be made aware of his jealousy and so become conscious of it when it holds his attention, but it does not imply that he was unconscious when he was not conscious of his jealousy. Also, once he is aware of his jealousy, and does not forget that he is, he needs no longer to be conscious of it.

But there is another problem with Cleeremans' thesis. To learn something is to acquire knowledge, including knowledge of oneself (self-knowledge is an ability which a person, as opposed to a brain, can cultivate or neglect). Thus, if I realized something is thus-and-so with me, then I am simply conscious of it. It is because I am self-aware and not brain-aware. The root of the confusing idea that a brain learns to become conscious of something is the assumption that consciousness is a form of knowledge a person is conscious of. Indeed, to recognize some object is to be able to identify the object based on one's previous learning and knowledge acquired and retained (not stored!) in memory. Thus, when I see my wife in a crowd, I am recognizing her and not remembering her. In this sense, what I now know, became conscious of, and am aware of, is her presence in the crowd. But it is not something I, let alone my brain, have learned; it entails that I have retained and exercised my recognitional ability.

An important source of knowledge, in addition to reasoning and teachers, is our five senses, which has several logical consequences. For instance, a person can notice something, such as a shadow in a bush or a bang, and may be conscious of it if it lasts some time; otherwise, a person cannot say that he was perceptually conscious of it. Put differently, what a person sees, hears, touches, tastes, and smells must preexist a person's being conscious of it, otherwise

[5] Wellman and Lagattuta (2004) correctly state that children's fascination with explanations "is an extraordinary curiosity about how to explain the activities of human beings." But they are wrong to assume that "children's questions focused on the causes of human activity… (e.g., Why did he do that?)" (p. 482). To ask for the cause of something is to ask for a nomothetic or teleonomic explanation (concerned with general laws of recurrent phenomena). By contrast, teleological explanations for a person's actions are to ask for his reasons or intentions which are concerned with understanding the person and why he performed a particular act (see Hacker 2010, pp. 162–232). The reason for that widespread confusion among psychological researchers is because of the standard practice among physicalist philosophers, and physical and biological scientists, to reduce teleological descriptions, explanations, and understanding to mechanical ones. Thus, "For most scientifically educated adults," a river makes fields fertile or provides a habitat for fish, but they "are consequences of the mechanical forces that caused it to form, rather than explanations for why it formed" (Kelemen 1999a, p. 1440).

the person could not have been conscious of what the person has seen, heard, or touched. By implication, a person cannot be conscious of what is not the case. But, and this is crucial, it is questionable whether we can voluntary choose or decide what to become conscious of through our senses, although we may voluntary choose or decide to ignore or not to acknowledge what we became conscious of.

What a person knows, a person can also learn or be trained to know in detail, thoroughly, well, and intimately. However, it does not imply that a person or a brain can learn or be trained to become conscious of things. What a person can learn is to become more receptive of stimuli. Neither does this imply that a person can be skillful at being conscious of stimuli; a person can only learn to be more sensitive to it.

In sum, children and adults (not their brains!) can be good at learning how and where to search for things, at detecting, discovering, and finding things out. It is, therefore, appropriate to ask "How do you know?" and "What made you conscious of…?" because there are sources of knowledge linked to such questions, for example, sense organs and perceptual abilities, reasoning, a teacher, and the Bible.

Brain-based learning: the prevalence of neuromyths

Concerns about the rapid proliferation of neuromyths, understood as "incorrect assertions about how the brain is involved in learning" (Dekker et al. 2012, p. 2), has been expressed in the scientific literature for quite some time now.[6] The neuromyths include beliefs such as "we only use 10% of our brains" (and we have noted that such a belief rests on a category mistake and conceptual confusions); people are left- or right-brain dominated; learners have a preference for certain learning styles; exercises could improve integration of left-right hemispheric function; and the brain would shrink if learners drank less than six to eight glasses of water a day. Despite expressed concerns regarding the proliferations of neuromyths and an increasing interest of teachers in brain-based learning, not much is known about their prevalence among professional educators.

It is against this background that Sanne Dekker et al. (2012) conducted a study of teachers in the UK and the Netherlands.[7] Their concern was that if neuromyths were to be found in their study then teachers will be most eager to implement wrong brain-based ideas in educational practice. It is of concern, because "neuroscience literacy" is a general understanding of the brain, which serves as protection against "incorrect ideas linking neuroscience and education" (p. 2). In addition, it is predicted that neuroscience literacy would increase by reading popular science magazines and newspapers. In other words, higher neuroscientific literacy serves two purposes: to increase beneficial effects and to decrease negative effects (i.e., misconceptions).

Their study shows that the three most prevalent myths were: 1) individuals learn better when they receive information in their preferred learning style (for example, visual, auditory, kinesthetic), 2) hemisphere dominance (left- or right-brain) can help explain individual differences, and 3) exercises can improve integration of left and right hemisphere brain function. In the words of the researchers: "More than 80% of the teachers believed these myths" (Dekker et al. 2012, p. 3).

Contrary to assumptions and predictions, teachers with higher general knowledge of the brain (average score 70%) were more prone to believe in neuromyths: "The present research showed that knowledge about the brain was higher when teachers read popular science magazines….; familiarity with brain research was not enough to distinguish myths from truth….; [and] greater knowledge about the brain does not appear to protect teachers from picking up neuromyths" (Dekker et al. 2012, pp. 5, 6). In short, teachers who possess greater knowledge of the brain and are eager to integrate neuroscience and education failed to recognize misconceptions about brain-based learning and education.

By way of summary, I agree with neuroscientist Steve Rose (2013): "it isn't brains that learn." It renders the idea that the brain has evolved to educate and to be educated wholly unintelligible. The reality is, however, that naturalist and physicalist scientists want people to believe that "You are your brain" (Greene and Cohen 2004, p. 1779) or "your synapses" (LeDoux 2002, p. x), and that "there is nothing else" (Ramachandran 2003). But since these beliefs are false, it is reasonable to conclude that most research in brain-based learning is either misguided and/or yields misinformation about the brain and learning. Conceptual confusion only exacerbates these problems.

[6] It is beyond the scope of this article to debate the merits for or against any of the views expressed by educators. For a discussion of the various neuromyths, see Alferink and Farmer-Dougan (2010); Beyerstein (2005); Bruer (1998, 2002, 2006); Davis (2004); Geake (2008); Howard-Jones (2008, 2013); Purdy and Morrison (2009); and Schumacher (2007).

[7] Another study (Zambo and Zambo 2011) provide profound insights into the beliefs of educators about the brain and learning. The researchers found that only 24% of the participants have reservations about neuroscience and education. Only 19% of the teachers believed that neuroscience was of no use to them at all, and do not want teacher training in brain-based strategies. One participant described such training as the latest fad teachers are following and as cult-like. The take-home lesson from this study: "non-believers" in brain-based education are not accepting secondhand information; they want to see the data themselves and investigate the validity of the claims.

Concluding Remarks

This paper focused on two interrelated topics relevant to the development and education of children: evolution by natural selection and brain-based learning. The purpose was to demonstrate that evolutionary education conflicts with human nature; people are natural teleologists and dualists. Research evidence indicates that the natural tendencies of people to explain phenomena in terms of purpose, their inherent natures, and intentional design are masked and suppressed rather than replaced by education based on the evolution story and physical-reductionist explanations. It is, therefore, misguided to think that theoretical understanding in the evolutionary sciences is a means to reformulate and shape the ordinary thinking and reasoning of children and adults while ignoring the fact that it is in ongoing tension with human nature.

There are numerous ways how detrimental affects of brain-based learning on children's thinking and reasoning about human nature can be avoided. Two have been suggested and discussed. Central to the confusions is the error to induce the brain (just as natural selection) with powers that can only be ascribed to agents. And, contrary to evolutionists and physicalists, "folk psychology" or the everyday conceptual framework of people is not a manifestation of a tacit theory.

Psychological concepts are used to describe, understand, and explain the world and human behavior in terms of purposes and reasons, and not the "big bang theory" or evolution. It is, therefore, not wrong to believe the sun rises in the east and sets in the west. The error is to think it is because of the activity of the sun. Likewise, it is not wrong to believe it is hard for people to look at anything without wondering what it is for; but it is a conceptual confusion and error to think that people "have purpose on the brain," that the human brain has evolved to be educated and/or that a brain is able to learn.

In contrast to evolution by natural selection, creationism does not have to be taught to be understood; and if we can learn from the ant and become wise, why not from children? Jesus of Nazareth, our Savior, did (Matthew 18:1–11).

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