

1994

# Cultural Constructivist Approach to the Teaching of Evolution

William W. Cobern
*Western Michigan University*, bill.cobern@wmich.edu



# Cobern, W. W. (1994). Cultural Constructivist Approach to the Teaching of Evolution. SLCSP Working Paper #112.

(This manuscript served as the basis for Cobern, W. W. Point: Belief, understanding, and the teaching of evolution. *Journal of Research in Science Teaching*, 31(5): 583-590.)

## Abstract

Educators typically think that one teaches evolution to develop students' conceptual understanding of evolution. It is assumed that if students understand evolution they will believe it. From a constructivist perspective it can be argued that understanding and belief, though related, are distinct concepts each of which is a potential goal for instruction. Though there are good reasons why belief should not be an instructional goal, achieving conceptual understanding requires that issues of belief be addressed. The point is that students are not likely to gain much understanding of something that they dismiss outright as unbelievable. What counts as believable for an individual rests on that person's world view. This article argues that instruction on evolution can profitably begin with a dialogue on what counts as believable. Such a dialogue would be based on a study of the cultural history of Darwinism which would allow students to see how people in Darwin's day wrestled with the same fundamental questions at issue today. The purpose of this strategy is to create a shared meaning in the classroom that certain fundamental questions are worth discussing and that the biological principles of evolution can contribute to that discussion. Thus, rather than trying to present evolution as a purely scientific issue, this article suggests the rather unorthodox strategy of explicitly addressing the social and cultural issues related to the topic of origins.

Evolution is a truly interesting subject. It holds a central position in modern biology. Theodosius Dobzhansky (1973, p. 125) went so far as to say, "nothing in biology makes sense except in the light of evolution." Evolution is also interesting because of its high public profile. No other topic in science has generated as much public comment and debate as has evolution. From the Huxley/Wilburforce debates of Darwin's time, to the Scopes "Monkey Trial" of 1925, to the balanced treatment legislative initiatives of the 1970s and 1980s, evolution has been the science community's lightening rod for public interest. In broad terms, the science community is committed to evolution as both an appropriate and essential aspect of the school science curriculum as one sees in the quote from Dobzhansky. They face, however, a largely unresponsive public as one sees in various surveys of public attitudes and knowledge concerning science and evolution. Clearly a problem exists. The solution for some in the science community is to overcome obdurate religious resistance. For others the solution is to increase the evolutionary content in curricula and to improve instructional approaches. Many science educators see it as a matter of both with the second solution being key to the first. One can find these approaches in many of the recent policy statements on science education (e.g., AAAS, 1989; California, 1990; NAS, 1984). In my view, these approaches simply will not suffice for the task at hand.

There is a question at the heart of the troubles one faces when teaching about evolution, what is the goal of this instruction? Many science educators will likely consider the answer to this question patently obvious. The goal is for students to acquire a knowledge about evolution. However, this answer is obvious only within a positivist view of science; and, in my opinion, the answer is both simplistic and unrealistic. In contrast, I offer a cultural constructivist approach to evolution education centered on six points. 1) A constructivist perspective implies that all teaching and learning takes place in context. 2) Metaphysics and world view are key cognitive aspects of any context - thus, the modifier "cultural". 3) Evolution as a topic of curriculum and instruction is placed in a context defined by teachers and curriculum writers. 4) To the consternation of all, the context of evolution education is frequently in conflict with the metaphysical and world view contexts brought to the classroom by students. 5) The theory of evolution and the role of evolution in science today does not necessitate this contextual conflict. 6) Lastly, there are instructional approaches that promote the sound teaching of evolution, but from within a different and culturally sensitive context.

## A Criticism Worth Heeding

At the onset of this discussion it is crucial for one to recognize that nowhere in science is the overlap between scientific ideas and other ideas in society more clear than with the theory of evolution and origins. Given this situation the science educator's focus is easily drawn to well advertised controversies only to miss the crux of this science and culture interaction. The nature of the science/culture interaction that often takes place in education has been criticized by Ogawa (1989) and Young (1974) among others. That criticism comes from both the political left and the political right is a measure of the significance of this criticism. The Marxist philosopher Herbert Marcuse (1966) decried the dehumanization of society brought about by the reductionism of the physical sciences that he viewed as endemic in American schools. On the opposite end of the political spectrum, Phillip Johnson (1991) decried the anti-religious bias of a science education unnecessarily wedded to philosophical materialism. From both sides comes the same criticism: there is more in science teaching than that to which teachers of science and the professors of science admit. This "more" that critics speak of is a particular metaphysical framework that is seldomly stated outright, but is implicit in most of science teaching. If there is a criticism of science education that is shared by the left and right wings of our society, then, it seems to me, this is a criticism to which science educators ought to pay attention. It is true that some object to this criticism claiming that the problem is not that something more than science is being taught along with evolution, but that evolution is not being taught at all (e.g., Stone, 1992). Even if this claim were granted at the high school level, and this is by no means a given, the objection could hardly be sustained at the college level. Yet, even at the college level one sees the rejection of Darwinism.

## Not One, but Two Goals

In 1959 three thousand scholars gathered at the University of Chicago for a week to celebrate the centennial of the publication of Darwin's Origin of Species. The celebration mantra was "one hundred years without Darwin [is] enough" (Tax, 1983, p. 37). One might have thought that the Scopes trial of 1925 marked the end of anti-Darwinism, and in the eyes of the media and of many scholars it did. In fact, the topic of evolution remained in the shadows of science teaching until the centennial celebration 34 years later (Grabiner & Miller, 1974). The momentum gained at the conference for bringing evolution into the mainstream of secondary school science led to significant changes in curriculum and textbooks. BSCS was at the forefront (Hurd, 1961; Mayer, 1986).

Unfortunately, the science education community misread American culture and was taken by surprise when anti-evolutionists fiercely counterattacked BSCS-

led curricula innovations with a spate of successful legislative initiatives. Moreover, ruled by a philosophy of "when in doubt, throw it out," textbook companies quietly dumped Darwin effectively neutralizing the post-centennial gains. Evolutionists and anti-evolutionist had been struggling for years but the new wrinkle in the 1970s was the legislative action to bring about a balanced treatment of evolution and what was touted as scientific creationism (Numbers, 1982). In the seesaw of attacks and counterattacks, the balanced treatment acts succumbed to court challenges and by the late 1980s evolution education was on the rise again (see Skoog, 1979; Pauly, 1991).

Riding the crest of renewed support for the teaching of evolution, science educators turned their attention to the question of how best to teach evolution. In the years after the centennial, constructivist oriented research such as misconception, alternative conception, and conceptual change research flourished providing for educators new insights on learning. Research results showed that students have a variety of notions about various aspects of evolution, for example adaptation or natural selection (see Helm & Novak, 1983; Novak, 1987; Wandersee & Mintzes, 1987). Learning is thus more accurately viewed as the change and development of concepts rather than a simple acquisition of concepts. Much research is now focused on how best to bring about conceptual change and development rather than on finding better ways to tell about evolution (Good, Wandersee, Anderson, Fisher, & Lawson, 1993).

The research is welcome but it would be a mistake to once again misread American culture. According to a recent Gallup Poll, only nine percent of all Americans believe the orthodox scientific view of evolution (reported by Sheler & Schrof, 1991). Educators are tempted to say that people reject evolution because they do not understand it or are simply uniformed. However, it stretches credulity to argue that only nine percent of Americans understand evolutionary theory. Moreover, similar findings are reported about college biology majors and teachers (e.g., Johnson & Peeples, 1987; Van Koevering & Stiehl, 1989). Is it possible that all of the curriculum innovations of the past 30 years have had so little effect? I believe it is more reasonable to conclude that even among those who have a basic understanding of evolutionary theory there are many who reject textbook Darwinism. Therefore, if the science education community expects that better techniques alone will substantially change this nine percent statistic, I fear we are in for a major disappointment - once again.

I applaud and support efforts to improve the teaching of evolution, but a more fundamental question must be addressed, what is the goal in regard to the teaching of evolution? To be specific, are we expecting instruction to improve understanding or to change belief? In the past this question would have held little meaning for many educators. Imbued by the spirit of positivism, educators observed a strict separation between knowledge and belief. In constructivist thought this separation largely evaporates and in the process a significant change of goal occurs. There are two possible goals, not one.

## Positivism and Constructivism

Logical positivism represents a distinguished formal school of philosophical thought which spawned a widely held colloquial view of science. Colloquial positivism roughly represents a classical view of realism, philosophical materialism, strict objectivity, and hypothetico-deductive method. Though recognizing the tentative nature of all scientific knowledge, colloquial positivism imbues scientific knowledge with a Laplacian certainty denied all other disciplines, thus giving science an a priori status in the intellectual world. Colloquial positivism is what Smolicz & Nunan (1975) called the myth of school science.

In a sense, the certainty of colloquial positivism can make life easy for the science teacher. Colloquial positivism allows the teacher to say to students that this is the way things are, for science provides the one reliable source of objective knowledge. No matter how tentative the current understanding of a phenomenon