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# Evolution Education: Is Our Approach Nonadaptive?

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Unlike any other subject that we teach, evolution is a topic that generates a sociopolitical response that frequently encumbers our efforts in providing our students with a comprehensive and contemporary science education. This influence is felt not only in the K-12 classroom but also in our colleges and universities.

Despite a long history of debate concerning the evolution education issue and court decisions endorsing the teaching of scientific evolution in the classroom, there remains strong sociopolitical pressure to replace scientific evolution with nonscientific beliefs. Despite a recent comprehensive study indicating that 83% of the U.S. population endorses and advocates the teaching of scientific evolution (People for the American Way, 2000; [www.pfaw.org/issues/education/creationism-poll.pdf](http://www.pfaw.org/issues/education/creationism-poll.pdf)), many teachers are afraid to teach scientific evolution in the classroom. This results in many K-12 and higher education students lacking an adequate exposure to or having an understanding of evolution. As these students will be the teachers and parents of tomorrow, this problem is passed on from one generation to the next. Without a significant change in the way teachers deal with the issue of scientific evolution, there may be little chance that this situation will be resolved.

Understanding the nature of science is at the core of a quality science education. In addition to facts, theories and formulas, science involves an evidence-based process of exploring and understanding our world. It is incumbent upon science educators to ensure that their teaching is true to the nature of science. This integrity is threatened when pseudoscience, paranormal and religious explanations are presented as legitimate alternatives to scientific thinking and explanations.

Although the quality of a science education is compromised when the subject of evolution is omitted, mitigated, or marginalized, equally detrimental outcomes can occur when the wrong pedagogical approach to teaching evolution is adopted.

Unlike other topics in science, teaching evolution frequently requires that we effect a change in the conceptual thinking of our students prior to beginning instruction. At the same time, we must recognize and respect their current belief systems concerning the origins and evolution of life. It is in these arenas where our instructional approach is commonly deficient and as a result, we may not succeed in obtaining our goal of teaching evolution effectively. It is therefore important that we understand the basis of our student's belief systems. As teachers, we must also learn to recognize the barriers that we may face in attempting have our students consider an explanation to the evolution of life that may not be congruent with the one to which they cling so tenaciously.

## Origins of Student Belief Systems

Belief systems of students, as well as adults, are usually the result of the interactions of several sources or origins of knowledge. Recognizing the source or origin of the belief systems of our students will allow us to more effectively teach towards conceptual change. Having our students recognize the origins of their own belief systems will also facilitate this goal.

**Innate-** Innate beliefs or knowledge is that “knowledge” gained from an “inner feeling of knowing the truth” or the colloquial “gut feeling”. Examples of innate belief statements may include such statements as “I just know it has to be true” or “I just know its the truth”.

**Revelation/Epiphany-** Beliefs or knowledge gained through a “sudden awakening to the truth”. Examples of revelation statements may include “It just came to me” or “One day I just realized the truth”.

**Mysticism/Paranormal-** Beliefs gained through some mystical/paranormal source such as crystals, tea leaves, astrology, clairvoyance, taro cards, etc.

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**Dogmatism-** Beliefs or knowledge gained based upon the assumed authority of some individual or authority e.g., religion, folklore, myths, legends.

**Empiricism-** Knowledge gained through practical experience and observation.

Although most members of our society hold beliefs that may be based upon several of these belief systems, science operates only in the empirical realm. In teaching the nature of science, we must emphasize this fact and restate it as we begin and progress through our discussions of evolution. Correspondingly, we must understand that students which adopt anti-evolution beliefs are denying the empirical evidence while accepting, most commonly, a dogmatic religious view. It is important that both student and teacher recognize the limitations of science in that science may not be equipped to disprove religious dogmatic beliefs. However at the same time, both must recognize the powerful ability of science to explain what is observed in nature utilizing empirical evidence substantiated by natural law (biological, chemical, geological, etc.) without requiring the intervention of a supernatural being or force.

### **Student Perceptions of the Relationships Between Science and Religion**

Much of the social and political concern regarding evolution education is focused around the perception of a conflict between two dichotomous camps; science and religion. Many students assume that there exist only two options; acceptance of religion or evolution. Nothing could be farther from the truth for most mainstream religions.

Following are several models or schools of thought pertaining to the relationship between science and religion.

**Same Worlds Model-** Science and religion deal with the same questions and therefore there is agreement, conciliation and no conflict exists.

**Separate Worlds Model-** Science and religion deal with different questions and therefore there is no overlap or contradiction and no conflict exists.

**Conflicting Worlds Model-** Science and religion deal with the same questions but do so very differently resulting in opposite views and conflict. There is no conciliation and one must be right and the other wrong.

**Shared Regions Model-** Science and religion deal principally with different questions and therefore do not generally conflict. However, there are areas of overlap and potential contradiction may occur.

There is value in attempting to determine which of the above models most closely parallel your student's view as well as your own. Few people may adopt the Same Worlds Model as it does not recognize the very real differences found between science and most religions. The Separate Worlds Model may be the most palatable to both groups and the most politically expedient, but once again, it does not recognize the very real conflicts that exist. By asking our students to accept this model and to deny their knowledge of the conflict, we are not being true to our goal of producing deductive and analytical thinkers.

Many teachers will find that their students subscribe to the Conflicting Worlds Model. It is this view that "only one can be right" that causes the belief dichotomy held by many students. However, this is not the position held by most mainstream religious groups as evidenced by their numerous position statements advocating evolution as appropriate science. In fact it is the Shared Regions Model that is the most widely accepted by mainstream religions in the United States such as the Catholic Church as well as dozens of others ([www.natcensci.org/voicont.htm](http://www.natcensci.org/voicont.htm)). Many refer to the various reiterations of this model as "theistic evolution" whereby a deity created life and evolution occurred from that point with various levels of involvement from the creating deity.

### **How Do Students Manage Their Ideology Conflicts?**

When students recognize that there may be a conflict between their scientific knowledge and their religious beliefs, they may develop strategies to cope with the conflict.

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**Denial of the Conflict-** Many students may take the “out of sight, out of mind” approach to managing the conflict between their religious beliefs and their scientific knowledge. This is an approach of just denying that there is any conflict.

**Avoidance of the Conflict-** On a subconscious level, the student may recognize that a conflict may occur, but avoids all intellectual inquiry that may cause the question of conflict to manifest itself.

**Reconcile Conflict-** The student attempts to deal with the perceived conflict by accepting the parts of evolutionary theory that are congruent or at least not in conflict with their religious beliefs. This approach is a type of *cafeteria evolution* where the student chooses which parts of evolutionary theory are palatable and rejects the rest. Typical of this approach is accepting microevolution (change within a population or within a species) but denying macroevolution (major phylogenetic changes e.g. amphibians giving rise to reptiles). Another typical example would be accepting macroevolution but denying its existence or influence in the evolution of humans.

Although the adoption of one of the above strategies may allow our students to be more receptive to our evolution instruction, adoption of these strategies demonstrates that we have not been successful in our goal of teaching the scientific process of analysis and logical deduction and that our students do not understand the true nature of science.

### **Evolution Education; Is Our Approach Non-adaptive?**

In order to be effective in teaching our students evolutionary theory, it is imperative that they first understand the nature of science ([www.nap.edu/readingroom/books/evolution98](http://www.nap.edu/readingroom/books/evolution98)) well beyond the recitation of the “scientific method” (in all of its obtuse manifestations). They must truly understand what science is capable of addressing as well as the limitations of science. Correspondingly, our students must

understand that science teachers and scientists both recognize that science is but one very valuable form of human inquiry as is theology, sociology and political “science”.

Once these prerequisites are met, we must then realize that each student may have formulated their belief systems based upon a matrix of sources including dogmatic as well as empirical beliefs. Our instruction must take this into account as well as our student’s views of the relationship between religion and science and recognition that they may see the two to be in conflict. We must then recognize that our students may be employing strategies to deal with these perceived conflicts that are not congruent with scientific thinking.

Our goal as educators is to provide our student’s with the best scholarship available in our field. In science, evolution and only evolution has been determined to be the best explanation of what we observe in our biological world. However, stating this fact does mean that our students will listen to this scholarship. It is therefore imperative that we teach evolution with the recognition that it is not just another topic in the semester. No other topic challenges the belief paradigms of our students as does evolution. Failure to recognize this fact and be proactive in modifying our instructional approach is non-adaptive and you will not succeed in your classroom environment. As in evolution, we must modify our teaching strategy to adapt to the present and particular classroom environment. Failure to do so, will result in our message being selected against.

In closing, I feel compelled to share a quote that was offered to beginning college students each semester by one of my past colleagues: “If you don’t accept evolution then you’re an idiot and I don’t talk to idiots”. Needless to say, this professor was not very successful in having his students consider alternative explanations. Use his approach as the antithesis of your approach and you will stand a much greater chance of being successful in helping your students understand and accept evolution as a very powerful explanation of the world around us.

Visit the Michigan Scientific Evolution Education Initiative (an initiative of the MSTA)  
<http://web.grcc.cc.mi.us/mseei>