

Students' Perceptions and Opinions of Unscientific Bias in Evolutionary Curriculum

Richard F. Lapworth
Florida International University, U.S.A.

Abstract: This is a qualitative study with eighth-grade students assessing their views of bias within the evolution chapters of two Florida state-adopted texts. The students determined that a significant degree of bias exists. The texts fail to develop the scientific "habits-of-mind" as stated in the school district's "science as inquiry" competencies.

Introduction

Kuhn (1962) elucidated the fundamental and pervasive role of paradigms in science. He noted that in periods of *normal science*, curriculum becomes dogmatic, and its primary role is to indoctrinate new adherents. To do so it glosses over remaining disagreements and debates, excludes anomalies and critiques, and suppresses dissension and alternative views. Only during periods of *revolutionary science* are scientists, and the curriculum, more open-minded and unbiased, focusing on anomalies and alternative interpretations.

Literature Review

The issue of bias within science books, specifically in the topic of origin theories, is well documented. A paradigm's adherents often exaggerate its strengths and ignore its weaknesses and critiques. Jonathan Wells (2000) in his pivotal book *Icons of Evolution* elucidates that the ten major "icons" of evidence for evolution are exaggerated, misleading and even false, and ignore all the contradictory evidence. Both Anderson (1995) and Wells (2000) rate most state-adopted science texts as D or F because of the texts' bias. The texts' *unscientific bias* is seen in the inadmission of incomplete evidence, withholding of anomalies, fraudulent data, presenting falsified ideas, speculation and opinion mistakenly called "theory," promoting ideologies and suppressing others, and worldview discrimination.

Such bias has been addressed by many local school boards and several state school boards and legislatures. In 1995, the Alabama State School Board voted to place an insert in the front of every state-adopted biology text that tells students to distinguish theory and interpretation from fact, be aware of evolutionary anomalies and to keep an open-skeptical mind. They wanted "to insure that the children of Alabama received training in how to think, rather than what to think, and that they receive a good science education, not ideological indoctrination" (Anderson, 1995, p.5).

The issue of bias has also been addressed at the federal level. The Senate recently passed the "No Child Left Behind" Act, which had attached to it the "Santorum Amendment" (which passed as an attachment 91 to 8). The amendment states, "where topics are taught that may generate controversy (such as biological evolution), the curriculum should help students to understand the full range of scientific views that exist" (Meyer, 2002).

Besides the bias that exists within text, there is also the reality of bias within the reader. From personal perceptual-filters to socially constructed/negotiated paradigm-filters, none of us is fully "objective" and open-minded. Deckard (1998) documented how students' worldviews play a fundamental role in how they interpret text, especially in constructing their views of the origin and purpose of the universe and life. Worldviews can act as *thought-filters*, causing adherents to

disregard discrepant experiences and anomalous data, rather than to reconstruct and accommodate one's schema.

Purpose

The purpose of this qualitative research is to assess students' perceptions and opinions of, unscientific bias in the evolution chapters of two Florida state-adopted texts: *Science – A Voyage of Exploration*, by Prentice Hall, and *Science Interactions – Course 3*, by Glencoe. The students will also be assessed about their own personal beliefs about origin theories, and their opinions about the paradigms of materialism and theism (as relates to science curriculum).

Rationale

The Tyler Rationale posits that curriculum is developed from three perspectives: the needs of society, the needs of the content area and the needs of the student (Schubert, 1986). All three of these domains provide a rationale for this research. Most polls reveal that about 70-80 % of the American public believes that materialism, evolution, is a limited and inadequate theory (Candisky, 2002). Polls also show that most stakeholders (about 70-80%) want a curriculum that teaches the evidence for and against evolution, and that evolution should be compared with other viewpoints (Meyer, 2002). Fundamentally, the public wants a curriculum that is dialectical in nature. A text should teach critical-thinking skills and educate students on "how to think," not indoctrinating them into "what to think"; it should develop and prepare the mind for the real world of diverse epistemologies.

The fact that there are many anomalies within evolutionary theory is well documented (Behe, 1995; Denton, 1986). Wells's (2000) critique of evolution, and specifically how it is taught within texts, has been met with much resistance by the evolutionary community. Several researchers have sought to refute his work and person, calling it "pseudoscientific," but his polemic is thorough in its scholarship (Luskin, 2002). Many evolutionists admit that there are problems, difficulties and contradictions in their theory. For example, Ager confesses that many of the "evolutionary stories" he learned in textbooks have now been "debunked" (Gish, 1993, p. 44). The oparin-haldane hypothesis (prebiotic "molecular evolution"), that is solely promoted as the answer to the origin-of-life problem, has been refuted by the evidence that the earth's early atmosphere was oxidizing, and that there is no paleo-geochemical evidence for an atmosphere containing the presumed/necessary amounts of ammonia and methane. This led one researcher to conclude, "these symptoms suggest a paradigm whose course is run, one that is no longer a valid model of the true state of affairs" (Overman, 2001, p. 44).

Students need, and are Constitutionally guaranteed, free access to data and ideas, yet if many texts suppress anomalous data, then where should they find it? The "origin debate" is often viewed as a controversial topic, and this can make it a powerful pedagogic tool in developing critical-thinking and epistemological analysis. Through presenting many sides of a controversial topic, students can "logically synthesize multiple frames-of-reference to resolve new problems" (McMurray, 1991, p. 184). Presenting controversial material also "counteracts classroom apathy, positively affecting the students' attitude toward participation" (Cook, 1984, p. 16).

The Miami-Dade Public School's (MDCPS) CBCs (Curriculum Based Competencies) provide a thorough apologetic for this study. Specifically, the "M/J Comprehensive 3 – 2002100" (MDCPS, 1998) states that students should be able to: 1.A.2 "interpret data, use evidence to generate explanations, and critique explanations and procedures"; 1.A.4. "differentiate between explanations from descriptions"; 1.A.5. "think critically and

logically...thinking critically about evidence includes deciding what evidence should be used and accounting for anomalous data”; 1.A.6. “recognize and analyze alternative explanations and predictions...[and] remain open to and acknowledge different ideas and explanations, be able to accept the skepticism of others, and consider alternative explanations”; 1.C.2. recognize that “science is very much a human endeavor...as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas”; 1.C.3. recognize that “...all scientific ideas are tentative and subject to change and improvement”; 1.C.4. “recognize that in areas where ... there is not a great deal of experimental or observational evidence and understanding, scientists differ ... about the interpretation of the evidence or the theory being considered,” as the same data may elicit conflicting results or differing conclusions from different scientists; and 1.C.5. recognize that “evaluation includes ... identifying faulty reasoning, pointing out statements that go beyond the data, and suggesting alternative explanations for the same evidence.”

Given these definitions of science inquiry and process skills, the term *unscientific bias* can be delineated. Essentially, it is when any of these competencies are not developed within the curriculum, or when any one of them is violated. For example, *Science Interactions-Course 3* teaches that embryonic nodes in the cervical region of the human fetus are “gill slits”, and are homologous with fish gills, but will develop into “lungs” (Aldridge, 1995, p.553). The accompanying drawing is based on the outdated and fraudulent work of Ernst Haeckel, along with Von Baer’s concept of “ontogeny recapitulates phylogeny”, and both have been refuted for over 30 years (Wells, 2000). It is now recognized that many assumed homologous structures are under the control of non-homologous genes and embryonic pathways, contradicting evolutionary predictions. To still use this evidence as support for evolution “bends the facts of nature...and distorts the evidence to make it fit the theory” (Wells, 2000, p. 105).

Method

Participants

Two eighth-grade students were randomly picked--one male, Chris, and one female, Vanessa--to participate in the survey.

Procedure

The survey was administered after the unit on origins and evolution. Besides the instruction they received in class, the subjects met with the researcher one time before the survey to insure that they understood the questions, and the key terms and concepts. They also met one time after the survey was completed to insure that they were satisfied with their responses and did not want to revise anything. The students were given one week to complete the survey at home.

Instrument

From the CBCs, I derived an eight-question survey. The questions seek to assess the students’ opinion of *unscientific bias*. Does the text develop the required objectives of teaching *scientific habits-of-mind*?

Results

The students’ responses to the eight questions are the following: Question 1: Did the book, authors, present anomalous data that may not be explained by evolution? Vanessa--“Not really, the authors only stuck to one main thing and did not mention any anomalies. They did not switch

to another theory." Chris--"No, they did not." Question 2: Did the chapter present alternative theories or explanations? Vanessa--"No, evolution was the only thing presented." Chris--"No, they did not mention other theories." Question 3: Did the authors discuss the fact that many experts do not agree about many points in evolutionary theory; there is not consensus within the scientific community? Vanessa--"No, they did not. The authors stood to their opinions and not once did they mention about other people being skeptical about evolution." Chris--"Yes, there was one man that talked and argued about the quagga and zebra." Question 4: Did the chapter encourage you to come up with your own explanations or answers different from the authors? Vanessa--"Yes, the authors encouraged me to think about the different size of the rabbit's foot, as well as the variations." Chris--"No, they did not encourage me to think on my own." Question 5: Did any of the chapters' material ask you to come up with alternative explanations, to critically evaluate evolution, to be skeptical and ask new questions, or to create your own hypotheses? Vanessa--"Yes, the bean experiment did discuss the variations of color." Chris--"No, they did not." Question 6: Do you personally believe in God's, spiritual forces, or anything supernatural? Vanessa--"Yes, I personally believe in all that was mentioned in the question: God and other possible Gods, spiritual forces, and a few other supernatural and unexplainable things." Chris--"Yes, I believe in god and supernatural things." Question 7: Do you believe that the origin of the universe, earth and life can be explained by naturalism, ie. evolution, or by supernaturalism, eg. creation or other supernatural theories? Vanessa--"I believe that the origin of the universe, earth and life can be explained by supernaturalism. I believe God made the earth, not because it says he made it in the Bible, but because of my strong gut feeling." Chris--"Yes, I do believe that there was, and still is, a creator." Question 8: Do you believe that a public school textbook is unscientific if it mentions the possibility that the origin of the universe and life may not have a natural explanation and may have a supernatural one? Vanessa--"I believe that a science book can and should discuss that there could be a God/creator who created this earth." Chris--"I believe a science book can talk about supernatural stuff."

Discussion and Implications

It can be seen from the majority of the students' responses that they believed that the texts did not present evolution in an honest, unbiased, manner, but that a significant degree of unscientific bias existed. Of course as only eighth graders, their schema of these issues are not well developed, nor their powers of textual analysis, but their answers corroborate with what experts have noted about textual bias. The only positive responses that provided evidence for a dialectic in the text were questions three, four and five (Vanessa's discussion about the use of variations in evolution, and Chris's about equine evolution). But, from a deconstructivist's view, this evidence for a dialectic is really superficial. The text ignores, or leaves out, the intense debate going on in scientific circles about extrapolating the processes of microevolution (changes in allele frequencies and mutations) into macroevolution. Many experts disagree that microevolution (horizontal phylogenetic adaptation, radiation or speciation) given enough time leads to macroevolution (vertical phylogenetic ascent creating entirely new and different organisms with qualitatively new structures, functions and information) (Behe, 1996). There is little or no evidence that mutations can actually add new functions and structures to a genome, based upon Behe's elucidation of the concept of "irreducible complexity", and Spetner's (1998) studies on the limitations of mutations.

Both students believed in theistic concepts and that the origin of the universe and life may have a theistic solution. Vanessa's response to question 7, "I believe that God made the

earth...because of my strong gut feeling,” supports the idea of peoples tacit knowledge of *something more* – their innate conviction that materialism is an inadequate paradigm in explaining the origin of life. Poll data also confirms that most people believe in some kind of theistic origin of life (Candisky, 2002; Meyer, 2002). The students’ responses to questions 6 thru 8 may be inferred as the need *epistemological diversity/sensitivity* in origin curriculum. Though science may not answer the *God question* it should not prohibit it being asked. To assume that *only* material answers exist is a religio-metaphysical assumption, is beyond the limits of science and displays a bias against theism. Legal experts agree that the 1st Amendment prohibits the “establishment of religion”, but not the suppression/exclusion of a theistic discourse, especially where this dialogue has the “secular purpose...or benefit” of good pedagogy, comparing epistemologies and teaching critical thinking (Bird, 1991, pp. 456-469).

It is clear from the students’ responses, and a perusal of the studied texts, that the competencies laid out by the MDCPS are not being fulfilled. The texts have little, or no, dialectic--thesis contrasted with antithesis. It could be argued that the texts present materialism— evolution—as an absolute indisputable fact, yet in doing so all anomalies are absent, and all the evidence is already pre-interpreted for the students. Where is the tentative, skeptical and open-minded attitude that characterizes sound science? Where are conflicting experimental results and discussions about the debates over ambiguous data, anomalies or alternative interpretations?

The goals of the cited MDCPS’s competencies are essentially to teach students the scientific habits-of-mind, and the proper domain and limits of science. Many philosophers of science conclude that science cannot arrive at absolute truth/certainty because inductive reasoning is based upon the limited data set of human experience, and cannot derive “universal statements”--stating that something is true at all places at all times (Bird, 1991).

Constructivism, and its learning theory, requires and implies that students are active in constructing their own schemas and epistemes, not just passive absorbers of an author’s theories, no matter how scientific they may seem. Guba and Lincoln (1989) use the terms *schema-sophistication* and *elaboration* for the process where schema grow with new information. Their *hermeneutic/dialectic learning cycle* is based upon the presentation of contrasting stakeholders’ constructs (a dialectic), and the interpretation of these by the learner, leading to the evaluation and synthesis of their own “sophisticated” schema. But this model assumes/requires that many stakeholder views are represented within the curriculum; if not, there can be no elaboration.

If there is no presentation of diverse views (alternative interpretations/theories) within a curriculum, there can be no perturbation of schema and no disequilibrium. As Piaget asserts, disequilibrium results from new anomalous/discrepant data, and leads to accommodation and cognitive development and growth. Yet, in the studied texts no anomalous data, or alternative interpretations, are presented. The obvious result is an absence of disequilibrium and a lost opportunity for accommodation. Plus, all the data in the texts is already pre-interpreted for the students within the evolutionary paradigm. The students are disempowered: they are not asked to think on their own and come up with alternative, personal constructions. Not that they should reject evolution, unless they are persuaded by the evidence, but in the absence of anomalous data they are not even given an opportunity to exercise their hermeneutic/dialectic learning cycles.

Are students, and other stakeholders, being disempowered and disenfranchised by the political hegemony being asserted upon them by an *evolution-as-fact* text? As Guba and Lincoln (1989), Kuhn (1962) and many others note, science is not an objective pursuit of “truth,” though that may be its ideal, but a primarily socially-negotiated political-process of power, where the established paradigm exerts control over research, publication, curriculum and thought. Once a

theory becomes the majority opinion, it acts as *thought-police*, excluding anomalous data, alternative viewpoints and anything that threatens its power and status.

History shows that the curricular pendulum-swings are the result of one stakeholder group winning and losing power from another. The materialists have gained power from the theists in the last 100 years, and the Scope's Trial symbolized the futility and bigotry of trying to keep ideas out of the classroom. In our attempts at a constructive reform, we should remember the words of John Scopes, "I believe in teaching every aspect of every problem or theory" (Bird, 1991, p. 454).

Constructivists use the analogy of blind men groping about an elephant and negotiating their constructs of it through discourse; each person brings unique experiences/observations and prior knowledge to the dialogue, out of which the construct *elephant* is created (Guba & Lincoln, 1989). But as seen in this study some observations, anomalous data and alternative interpretations are excluded or suppressed because some of the participants do not continue to ask new questions. It is often the illusion of knowledge that is the greatest obstacle to scientific discovery.

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