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ABSTRACT

Postmodernism is a multi-faceted movement of people who share a dissatisfaction with knowledge claims that embrace universalism. In contrast to science, the centerpiece of the Enlightenment, postmodernism sees only power games of discourse with no external reality existing as the ultimate arbiter. In science education, postmodernism is seen in the proposals for "robust" multicultural science education and radical constructivism. Proponents for each of these movements refer to the postepistemological nature of their positions. The Portland Public Schools African-American Baseline Essays illustrates what can occur when reasonable ideas about the nature of science (i.e., Science for All Americans, National Science Education Standards) are rejected in favor of "robust" multicultural science education. Confusing science with technology appears to be one of the most common errors of many science critics and the role of nature is very much diminished in postmodern accounts of science. Inclusion is separated from the rejection of universalism by showing that it is a moral not an epistemic policy or goal. It is also argued (following Siegel, 1995) that inclusion is as much the moral property of modernists as it is of the postmodernists. (Contains 23 references.) (Author)

PERSPECTIVES ON POSTMODERNISM AND SCIENCE EDUCATION

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Perspectives on Postmodernism and Science Education

Abstract

Postmodernism is a multi-faceted movement of people who share a dissatisfaction with knowledge claims that embrace universalism. In contrast to science, the centerpiece of the Enlightenment, postmodernism sees only power games of discourse, with no external reality existing as the ultimate arbiter. All knowledge is local.

In science education, postmodernism is seen in the proposals for "robust" multicultural science education and radical constructivism. Proponents for each of these movements refer to the postepistemological nature of their positions. The Portland Public Schools African-American Baseline Essays illustrates what can occur when reasonable ideas about the nature of science (e.g., Science for All Americans; National Science Education Standards) are rejected in favor of "robust" multicultural science education. Confusing science with technology appears to be one of the most common errors of many science critics and the role of Nature is very much diminished in postmodern accounts of science.

Finally, inclusion is separated from the rejection of universalism by showing that inclusion is a moral not an epistemic policy or goal. Also, it is argued (following Siegel) that inclusion is as much the moral property of modernists as it is of the postmodernists.

Perspectives on Postmodernism and Science Education

The importance to the science education community of understanding the term postmodernism was underscored strongly by the publication of the National Research Council's National Science Education Standards: A Sampler in November 1992. On page A-2 in that document is the statement "The National Science Education Standards are based on the postmodern view of the nature of science." From what I understood of "the postmodern view of the nature of science" at that time, I was surprised to learn that the National Academy of Sciences, through the National Research Council, was basing its science education standards on the shifting sands of postmodernism.

My understanding of postmodernism then and now relates it closely to relativism, the position that allows one to embrace competing knowledge claims as (more or less) equally good or viable. I stated my position then on "the postmodern view of the nature of science" in a letter sent to those responsible for the development of the Standards and in a JRST editorial published in May 1993. In the "Slippery Slopes of Postmodernism" editorial I cautioned science educators to be aware of the pitfalls of the "wispy world of postmodernism."

Shortly after the Slippery Slopes editorial, an editorial entitled "Postmodernism" appeared in the July 9, 1993 issue of Science. Richard Nicholson, Executive Officer of the American Association for the Advancement of Science, alerted readers of Science to the potentially negative impact of postmodernism on the enterprise of science. Nicholson referred to a recent Sigma Xi speech by Harvard's Gerald Holton to warn of the "decidedly antiscience" position of postmodernism. Although he made no attempt to define postmodernism, as spokesperson of the largest scientific society in the world, Nicholson made it clear that this "decidedly antiscience" movement has the potential to impair the status of science by blaming it for the ills of the world.

It is important to note here that the statement on postmodernism that appeared in the November 1992 draft of the Standards did not reappear in the 1993 draft, nor does it exist in the final 1996 version. Why it was included in that early version of the Standards is not clear to me, but it seems reasonable to assume that few people responsible for that version understood the implications of stating that our national science education standards, sanctioned by the National Academy of Sciences, were based on the postmodern view of the nature of science.

What is it about postmodernism that allows the NAS to proclaim, albeit temporarily, that our science education standards should be based on a postmodern view of the nature of science, while the AAAS alerts its members to the decidedly antiscience nature of the postmodern movement? It is this question that I try to answer in this paper by (a) looking more carefully at postmodernism in its various guises, (b) identifying ideas and practices in science education that seem to be based on the relativism of postmodernism, and (c) arguing that it is not necessary to reject the universalism of Nature and the natural sciences in order to embrace inclusive policies and practices that lead to the ideal of

science literacy for all.

What Is Postmodernism? Some Definitions

Whether it is written post-modernism or postmodernism, the movement that science historian Gerald Holton referred to as "decidedly antiscience" includes a wide variety of proponents who criticize and reject the notions of objectivism, truth, universalism and most other assumptions and methods commonly associated with the enterprise of science. In their comprehensive text on understanding curriculum, Pinar et al. (1995) define postmodernism as a many-faceted movement of people who share a dissatisfaction with knowledge claims that embrace universalism:

> Within the last decade poststructuralism and deconstruction have come to be seen as part of a larger movement, parts of a new historical period termed postmodernism. Postmodernism articulates many of the ideas advanced by poststructuralism and deconstruction, including: the death of the subject, the repudiation of depth models of reality, metanarratives, and history itself, the illusion of the transparency of language, the impossibility of any final meaning, the movement of power as it represents and discourses on the objects it constructs, the failure of reason to understand the world, the de-centering of the Western logos and with it the "first world," the end of beliefs in progress, and the celebration of difference. (p. 468)

Pinar and his co-authors are sympathetic reviewers of the various postmodern agendas they describe in their text on curriculum theory, so one can develop an impression that this movement is necessary to advance the causes of equality and inclusion in education and in the larger society. Perhaps those responsible for the postmodern-view-of-science statement in the 1992 draft of the Standards had been reading some of the 3000 + works referenced in Pinar et al.

In a far less sympathetic critique of postmodernism, Gross and Levitt (1994) articulate views that, most likely, reflect the scientific community's position:

> Postmodernism is embedded and elaborated in the scholarly work of the academic left, notably in fields such as literary criticism, social history, and a new hybrid called "cultural studies." Postmodernism is grounded in the assumption that the ideological system sustaining the cultural and material practices of Western European civilization is bankrupt and on the point of collapse. It claims that the intellectual schemata of the Enlightenment have been abraded by history to the point that nothing but a skeleton remains, held together by unreflective habit, incapable of accommodating the creative impulses of the future. (pp. 4-5)

Among the first in the scientific community to study and publicly critique postmodernism, Paul Gross (scientist) and Norman Levitt (mathematician) denounce "...a point of view that must flirt continuously with nihilism":

> Contrasted to the Enlightenment ideal of a unified epistemology that discovers the foundational truths of physical and biological phenomena and unites them with an accurate understanding of humanity in its psychological, social, political, and aesthetic aspects, postmodern skepticism rejects the possibility of enduring universal knowledge in any area. It holds that all knowledge is local or "situated," the product of interaction of a social class, rigidly circumscribed by its interests and prejudices, with the historical conditions of its existence. There is no knowledge, then; there are merely stories, "narratives," devised to satisfy the human need to make some sense of the world. In so doing, they track in unacknowledged ways the interests, prejudices, and conceits of their devisers. On this view, all knowledge projects are, like war, politics by other means (p. 72).

Throughout their book Gross and Levitt deride postmodernism as "the realm of idle phrases" and attribute much of the movement to resentment of science by a frustrated academic left trying to "assert that the methods of social theory and literary analysis are equal in epistemic power to those of science" (p. 12).

Positioned between the sympathetic review of postmodernism by Pinar et al. (1995) and the stinging critique by Gross and Levitt (1994) is the analysis by Rosenau (1992). In her densely-referenced analysis of postmodernism and the social sciences, political scientist Rosenau compares affirmative and skeptical postmodernists. The skeptics offer a pessimistic, negative view of current civilization with an absence of moral guidelines and social chaos, apparently inspired by Heidegger and Nietzsche. Without moral guidelines or the possibility of truth, the play of words is all that is left. The affirmatives agree with the skeptics' critique of modernity, but have a more optimistic view of the postmodern age. While most affirmatives "seek a philosophical and ontological intellectual practice that is nondogmatic, tentative, and nonideological" many agree that certain value choices are better than others (p. 16.)

Dissatisfaction with Science

Rosenau (1992) notes that postmodernism in the U.S. can be traced to 20th century French postmodernists such as Jacques Derrida, Michel Foucault, and Paul Sartre and German philosophers Martin Heidegger and Friedrich Nietzsche. While the appeal of postmodernism grows in the U.S., it seems to have lost its appeal in France and other European countries. A general dissatisfaction with modern science seems to be the source of the emergence of postmodern activity and Rosenau identifies six perceived inadequacies in both the social sciences and the natural sciences (p. 10): (a) Failure to produce dramatic results promised by supporters, (b) Abuse and misuse of modern science, (c) Discrepancy between the way science was supposed to function in theory and how it actually worked, (d) Incapacity of science to solve the major problems of the 20th century, (e) Ignoring the mystical and metaphysical dimensions of existence, and (f) Science's silence on the purposes to which knowledge should be put. Disillusionment with science and pessimism about our future, especially for those deprived of power, seems to

underlie much of the fascination with feelings, fantasy, and the unusual common among postmodernists. Affirmative postmodernists are less pessimistic than the skeptical postmodernists, but all tend to reject reliance on universalism, reason, and evidence. The consequences of the rejection of reason and evidence matter less in the arts and humanities than in the social and natural sciences; however this distinction seems to be lost in the postmodernists' world.

Postepistemological Postmodernism

Skeptical postmodernists see no need for a conception of reality while the affirmatives support a constructivist theory of reality. The skeptics see language as the only reality. The affirmative constructivist sees no distinction between mental states and the outside world. Even the natural sciences are seen as power games of discourse, with no external reality existing as the ultimate arbiter. Edleman (1988) argues that the abandonment of objectivity is a sign of maturity and tolerance and for Wortman (1987), since reality is a linguistic convention, meaning and knowledge are relative.

The anything goes motto of Feyerabend (1975) is used in one way or another by postmodernists. The very word method is to be avoided as much as possible, in favor of intuition, feelings, and creative play. If there is a "method" associated with postmodernism it is deconstruction. Deconstruction identifies inconsistencies or tensions but does not try to reconstruct or suggest alternatives. Rosenau (1992) identifies eight underlying principles and strategies of deconstruction (p. 121):

1. Find an exception to a generalization in the text and push it to the limit so that this generalization appears absurd.
2. Interpret the arguments in a text being deconstructed in their most extreme form.
3. Avoid absolute statements in deconstructing a text, but cultivate a sense of intellectual excitement by making statements that are both startling and sensational.
4. Deny the legitimacy of all dichotomies because there are always a few exceptions to any generalization based on bipolar terms, and these can be used to undermine them.
5. Nothing is to be accepted; nothing is to be rejected. It is extremely difficult to criticize a deconstructive argument if no clear viewpoint is expressed.
6. Write so as to permit the greatest number of interpretations possible.
7. Employ new and unusual terminology.
8. Never consent to a change in terminology.

Text is used by postmodernists to mean anything and everything. According to Ellis (1989) deconstruction has an "alternative logic" that can never be made explicit and Culler (1982) asserts that deconstruction is not concerned with what a text means.

By now it should be clear that postmodernism, although difficult to define, is very different than science in terms of its ideas about knowledge and how it is developed. The common epistemological assumptions of science are absent in postmodernism. Abandoning reasoning is a liberating experience for the postmodernist who embraces all texts as equal in value. Such a postepistemological position may be acceptable for the arts and humanities, but it is clearly unacceptable for the sciences. Postepistemological postmodernism (PP) abandons shared inquiry, with its communally-agreed upon methods, for standard-less, criteria-free, individual perceptions.

Postmodernism as Constructivism

Just as there are many "flavors" of postmodernism, constructivism offers us many "faces" (Good, Wandersee, & St. Julien, 1993). In the 1990s constructivism has become a kind of mantra that nearly all science educators chant when explaining how students learn science. A major problem with constructivism, from the standpoint of epistemology, is its postepistemological flavor. This postepistemological position for constructivism has been argued by von Glasersfeld (1987), Noddings (1990), and others. As Good et al. (1993) have pointed out, "Using the term postepistemological suggests that important questions about the nature of science can be bypassed, reducing the domain of study for constructivists to psychological and pedagogical considerations" (p. 72). The science in science education can be de-emphasized or changed to allow the curriculum to be defined in terms that are more convenient, more flexible, more postmodern.

Matthews (1994) identifies two major traditions of constructivism: (a) psychological constructivism that originates with Jean Piaget's focus on the individual and then branches into the social constructivism of Lev Vygotsky and his followers, and (b) sociological constructivism that originates with Emile Durkheim and is now seen in the work of sociologists of science such as David Bloor, Bruno Latour, and Steve Woolgar.

Matthews (1994) notes that, "At its core constructivism has a subjectivist, empiricist, and personalist understanding of human knowledge" (p. 139). Both Matthews and Suchting (1992) do a thorough analysis of von Glasersfeld's "radical constructivism" and conclude, "There is no preferred epistemic conceptual structure; constructivism is a relativist doctrine" (Matthews, 1994, p. 149). Epistemologically, constructivism seems to have many of the characteristics attributed to postmodernism, especially the affirmative kind.

Sociological constructivism, and especially the work of Latour and Woolgar (1986) has been critiqued by Slezak (1994a, b) and others with similar findings; relativism is at its epistemic core. What Laudan (1990) has referred to as "the most prominent and pernicious manifestation of anti-intellectualism in our time" (p. x) can be called "rampant relativism." The stinging critiques of Gross and Levitt (1994), Laudan (1990), Matthews (1994), Slezak (1994), Suchting (1992), and others who care about and understand epistemic claims and why they are so important to science and science education are required reading for science educators.

I have tried in this first section to describe the nature of postmodernism, although its shifting nature defies accurate description. In fact the shifting, shadowy nature of postmodernism, with its lack of epistemic structure and intent to defy logical analysis, seems to be the best defining feature! In the remainder of the paper, I look more closely at recent practices in science education that reflect certain postmodern tendencies.

Postmodern Parallels in Science Education

Many of the same theorists who are cited by the literary and cultural critics are used as guides by some in science education to promote more personally relevant versions of science for students. For the curriculum theorists in science education who embrace the postmodern doctrine of Heidegger and Nietzsche, Derrida and Foucault, and others with similar relativist persuasions, the science in science education is simply not taken seriously. Behind the banners of radical constructivism (i.e., the postepistemological kind) and multiculturalism (especially the robust, curricular kind) science education takes on many of the characteristics of postmodernism.

Multicultural Science Education

Being sensitive to the special needs of students has been a theme in education for a very long time. During the 1950s and 1960s, Jean Piaget's ideas on cognitive development were very influential and educators tried to be sensitive to students' developmental levels. During the 1970s and 1980s, students' prior knowledge constraints were emphasized and the (mis)conceptions studies in science education became a dominant theme. With these two themes continuing to enjoy influence among many educators, there are signs that a third theme is trying to emerge. The 1990s and the beginning of the 21st century might give rise to the multicultural theme. All three themes stress the importance of sensitivity to students' prior experience and knowledge about the natural world that students bring to the classroom, but the multicultural theme stresses cultural background as well. A culturally-sensitive educational environment, with the teacher as the most prominent feature, must account for possible influences of students' cultural backgrounds. The role of the teacher in the 1990s has never been more demanding!

One of the earlier attempts to develop a culturally-sensitive education environment was the Portland Public Schools African-American Baseline Essays. I use the science part of the Baseline Essays to illustrate what can happen when clear thinking about the nature of science is displaced by a desire to "...develop in all students a better understanding and appreciation of the history, culture, and contributions to society of different ethnic groups and cultures" (p. ii). "African and African-American contributions to Science and Technology" contains ideas and recommendations that are intended to "clarify" students' understanding of the nature of science. The most fundamental principles of this document begin on page S-12:

This concept called Maat represents the first set of scientific paradigms: A set of general principles which serve as the basis from which the ancient Egyptians did all types of scientific investigations. Let us take a cursory examination of a few of the most fundamental ones.

1. ACKNOWLEDGMENT OF A SUPREME CONSCIOUSNESS OR CREATIVE FORCE

   The Egyptians notwithstanding, most African peoples' lives were and are, even today despite the influence of secular materialism or Marxism, ritualized about the adoration and service of some Supreme Consciousness or Creative Force.

2. EXISTENCE VIA DIVINE SELF-ORGANIZATION

   From being co-conscious with Nature, they readily saw the relationship between all living things. Creation is a dynamic ongoing process, yet God is the evolver of all things, not chance. As Einstein said, "God doesn't play dice with the universe."

3. A LIVING UNIVERSE

   To the Egyptians, the entire cosmos is a unity, a living entity, and as such, everything is alive. All things are related either directly or indirectly, and furthermore, everything is affected by everything else.

4. MAN/LIFE ITSELF IS A MYSTERY

   African people see life as the Creator's supreme mystery: they accepted the fact that their knowledge was limited, and would always be so (eons before Kant).

The list continues with four more principles, and in its 91 pages "African and African-American Contributions to Science and Technology" lives up to Feyerabend's dictum of anything goes. Critic of the Science Baseline Essays, Ortiz de Montellano (1992) tells us they (Essays) "have been adopted or are being seriously considered by school districts as diverse as Fort Lauderdale, Detroit, Atlanta, Chicago, and Washington, D.C." (p.2).

I use this example of multicultural science education guidelines run amuck to illustrate what can happen when a clear understanding of the nature of science is absent or suppressed in favor of more pressing needs. If the shoe doesn't fit, use a sock and call it a shoe. In the postmodern world of anything goes, this sort of creativity would receive high marks.

Matthews (1994) refers to robust multicultural science education (MSE) to mean that local or ethnic ideas about nature are recognized as legitimate alternatives to universal science. In the Science Baseline Essays principles of Maat replace traditional notions of science. Robust MSE proponents (e.g., Hodson, 1993; Jegede, 1989; Ogawa, 1989; Pomeroy, 1992; Smith, 1992; and Stanley & Brickhouse, 1994) claim that the science and science education communities have ignored good science done by many local/ethnic cultures. They appear to ignore the epistemic requirements, especially universalism, of the scientific community and, instead, adopt the postmodern stance of anything goes. It does not seem to matter that the explanations generated by ethnic science might be tied directly to supernatural beliefs. Most of the examples of neglected "science" suggested by proponents of robust MSE are from folk medicine or agriculture and reflect a confusion of science and technology. Wolpert (1993) identifies this kind of confusion as the source of much of the current tendency to blame science for problems such as pollution of our air and water, overpopulation, and threat of nuclear, chemical, and biological warfare.

Rejection of Universalism

As we saw earlier, postmodernism rejects "depth models of reality, metanarrative and history itself" and accepts "the failure of reason to understand the world" (Pinar et al., 1995, p. 468). The concept of progress, associated most closely with the natural sciences, is repudiated by postmodernists. Universalism, the core assumption among scientists, is likewise rejected and replaced by separate stories, each with its own method and value system. The ideal of a unified epistemology does not exist.

How can a reasonable person deny the progress made by the natural sciences since the seventeenth century? How can a rational person deny the universalist nature of Nature and the natural sciences? For postmodernists, the answer seems to be, "just say it isn't so." Postmodern curriculum theorist William Doll (1993) constructs his vision of a postmodern world out of creative interpretations of the uncertainty theory of Heisenberg, the indeterminacy proof of Godel, and especially the chaos theory of Prigogine. The paradigm Doll (1993) sees emerging from his insights of chaos theory "...requires of us nothing less than a brand new start in the description of nature -- a start which will affect our metaphysics as well as our physics, our cosmology as well as our logic" (pp. 90-91). Armed with his visions of chaos and personal insight, this postmodernist rejects the universal character of Nature and the knowledge generated by the natural sciences in favor of a world more attuned to his desires. Doll's affinity for the spiritual, mystical aspects of humanity in his search for meaning and a new postmodern world out of chaos is evident throughout his writing, and Pinar et al. (1995) assess his contributions to curriculum theory in glowing terms: "More than any other scholar, Doll reviews these major concepts associated with postmodernism and formulates clearly and accessibly a postmodern curriculum theory. His contribution is great" (p. 503). Apparently, Doll's work is "state of the art" in curriculum theory circles. It is not difficult to imagine scientists' reactions to Doll's chaotic visions for a science of tomorrow.

In previous work (Good, 1995; Good & Demastes, 1995) I asked the question, Is it necessary to assume a universalist position on Nature and the natural sciences in order to be seen as taking science seriously? The universalist position on Nature and the natural sciences is supported by the many scientists and others who contributed to the American Association for the Advancement of Science (AAAS), Project 2061's Science for All Americans:

> Science presumes that the things and events in the universe occur in consistent patterns that are comprehensible through careful, systematic study. Scientists believe that through the use of the intellect, and with the aid of instruments that extend the senses, people can discover patterns in all of nature.
>
> Science also assumes that the universe is, as its name implies, a vast single system in which the basic rules are everywhere the same. (p. 3)

Throughout Science for All Americans similar statements support Matthews' (1994) statement on the core universalist idea of science:

> The core universalist idea is that the material world ultimately judges the adequacy of our accounts of it. Scientists propose, but ultimately, after debate, negotiation and all the rest, it is the world that disposes. (p. 182)

With the recent publication of the National Science Education Standards (National Research Council, 1996) many more statements supporting universalism in science are readily found:

> Science assumes that the behavior of the universe is not capricious, that nature is the same everywhere, and that it is understandable and predictable. (p. 116)
>
> Newton's laws of force and motion, Kepler's laws of planetary motion, conservation laws, Darwin's laws of natural selection, and chaos theory all exemplify the idea of order and regularity. An assumption of order establishes the basis for cause-effect relationships and predictability. (p. 116)

From these statements it is clear that postmodernism, with its emphasis on local knowledge and relativism, does not support science's core ideas on universalism. A leading spokesperson for the postmodern view of multiple, equally-valid sciences (i.e., robust MSE) is feminist philosopher Sandra Harding. In various publications Harding raises the question -- Is science multicultural? -- with the answer, "...there could be many universally valid but culturally distinctive sciences" (1994, p. 320). To give some idea of how Harding reaches such a conclusion, here is an extended quote that, according to Harding (1994), provides "evidence" for the claim:

> If we were to picture physical reality as a large blackboard, and the branches and shoots of the knowledge tree as markings in white chalk on this blackboard, it becomes clear that the yet unmarked and unexplored parts occupy a considerably greater space than that covered by the chalk tracks. The socially structured knowledge tree has thus explored only certain partial aspects of physical reality, explorations that correspond to the particular historical unfoldings of the civilization within which the knowledge tree emerged.
>
> Thus entirely different knowledge systems corresponding to different historical unfoldings in different civilizational settings become possible. This raises the possibility that in different historical situations and contexts sciences very different from the European tradition could emerge. Thus an entirely new set of "universal" but socially determined natural science laws are possible. (From Goonatilake, 1984, pp. 229-230)

In the land of postmodernism, as in the land of Oz, when you want something to change you just "say it isn't so." Here it seems that the universalism of Nature is reduced to playing a minor role while different cultural/historical "unfoldings" assume center stage. As Gross and Levitt (1994), Matthews (1994), Rosenau (1992) Slezak (1994a, b) and others have observed, postmodernists attempt to show that construction of knowledge is basically a political struggle, leaving little room for the role of nature in science (see Good & Demastes, 1995 for more on the "diminished role of nature" theme).

There seems to be no epistemological basis for postmodernism. The postepistemological position for radical constructivism argued by von Glasersfeld (1987) and his followers is equally true for postmodernism. Postmodernism seems to be mostly a moral rather than an epistemological issue, as argued by Siegel (1995) in the case of inclusion. This argument is presented in more detail in the following section.

Inclusion Within Universalism

In his 1995 Presidential Address of the Philosophy of Education Society, Harvey Siegel argued that inclusion is best understood as a moral rather than an epistemological issue. In this section I rely heavily on Siegel's remarks, subsequently published in Teachers College Record, to argue that postmodernism like inclusion, is mainly a moral rather than an epistemological issue. This may very well be a case of incommensurable paradigms that Thomas Kuhn talked about in his 1962 book, The Structure of Scientific Revolutions. Although Kuhn was referring to scientific paradigms, it now seems clear that postepistemological postmodernism is incommensurable with scientific knowledge claims on epistemological grounds.

Siegel uses the term inclusion to signify the main objective of postmodernism. The exclusionary practices of science are compared to the inclusionary practices of postmodernism and Siegel (1995) tries, successfully I think, to separate inclusion from the

rejection of universalism: "My separation of inclusion from the rejection of universalism and of standards is a function of my view that inclusion is to be defended on moral rather than epistemic grounds" (p.).

This statement is reminiscent of one by Bertrand Russell, used by Gross and Levitt (1994) to introduce their first chapter:

> Ever since puberty I have believed in the value of two things: kindness and clear thinking. At first these two remained more or less distinct; when I felt triumphant I believed most in clear thinking, and in the opposite mood I believed most in kindness. Gradually, the two have come more and more together in my feelings. I find that much unclear thought exists as an excuse for cruelty, and that much cruelty is prompted by superstitious beliefs.
>
> Bertrand Russell, Autobiography

Inclusion is as much the moral property of modernists as it is of the postmodernists. Siegel (1995) argues that any theory worthy of the name must be both particular and universal. The particularity or context embraced by postmodern inclusion does not force a rejection of universalism. Russell's realization that kindness (i.e., inclusion) and clear thinking are closely related is central to Siegel's argument that a commitment to particularity/inclusion does not require a rejection of universalism:

> More generally, there is no contradiction, or even tension, between acknowledging particularity and at the same time constructing universalistic theories. Ideals, and theoretical claims about them, can be both particular and universal. (Siegel, 1995, p.)

Siegel goes on to argue that reason and objectivity cannot be rejected, as postmodernists seem to want to do, because it is then impossible to accept or reject standards whether particular or universal. He closes his argument on inclusion and standards with the following:

> For exclusion based on either lack of qualifications or expertise, or failure to meet appropriate standards governing scholarly exchange, involves no moral failing. It does not fail to treat the excluded with respect. (p.)

In the writings of science educators proposing inclusion (e.g., robust MSE) we see an assumption that excluding certain cultures' folk wisdom about Nature from science is equivalent to showing disrespect for those cultures. To assume that a culture must have participated in scientific activities in order to be accorded respect and dignity is, in my view, disrespectful. Just because a culture did not or still does not engage in scientific activity does not mean that culture should be respected less.

The moral high ground of inclusion is not the exclusive property of postmodernists. Taking science and epistemology seriously in no way suggests that scientific approaches

to resolution of conflicting knowledge claims are any less moral than other approaches. In fact, following the earlier advice of Bertrand Russell and Siegel's argument concerning inclusion, rational, scientific approaches to settling disputes are more likely to lead to kindness and fairness for all.

The goal of inclusion expressed in Science for All Americans is more likely to be realized if a rational, scientific approach is followed than with a postmodern approach (i.e., anything goes). Caring about epistemology means caring about reasons and, therefore, fairness. The current fascination with postepistemological approaches to education, including science education, offer empty promises without reasonable, fair solutions. Just what kinds of arguments will be influential to postmodernists, especially the skeptics, is unclear. Siegel may be right when he says that only those "...already disposed to worry about rational justification and related epistemological matters" (p.) are likely to be influenced by rational argumentation.

The allure of postmodernism is that it allows everyone to be correct, at least for the moment. All voices are heard equally, at least for the moment. It seems to be the ultimate in fairness and kindness, at least for the moment.

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