9-28-1996

# Traditional Culture and Science Education in Africa: Merely Language Games?

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

# Traditional Culture and Science Education in Africa: Merely Language Games?

**A paper presented at the meeting for,**

**Traditional Culture, Science and Technology, and Development: Toward a New Literacy for Science and Technology**

**Tokyo Institute of Technology**
**Meguro-ku, Tokyo, Japan**

**28 September, 1996**

**William W. Cobern, Ph.D.**
**Professor of Science Education**
**Western Michigan University**
**Kalamazoo, MI 49008-5192**
**USA**

I want to begin today with two short personal remarks. My field of research at home is the cultural study of science education. In other words, I am interested in what is commonly called the culture of science and how that becomes interpreted in science education by teacher and curriculum. I am interested in the variation of culture among American students, cultural variations grounded in family and community and brought to the classroom. I am interested in the cultural interactions that are precipitated by the meeting of cultures in the science classroom. In my current work I use worldview concepts to examine the various ways students and teachers have come to understand the natural world and the manner and extent to which science has informed that understanding. I came to this avenue of research from my experiences as a lecturer in science education at Usmano Dan Fodio University, Sokoto, Nigeria. My research in the USA, in other words, is grounded in an African experience.

My research leads me to think anew about an important question that must be answered by any one in science education: What knowledge are we thinking about when we think about the knowledge to be learned as the objective in science education? This question be approached from both internal and external perspectives. The internal perspective is the more obvious one. It is the perspective of science disciplines. From an internal perspective the question is about what topics shall be taught in biology, chemistry, physics, earth science and so on. From an external, or cultural, perspective the question is about what place scientific thought will hold and how will it be interpreted within the worldview of an educator person. This also may be phrased as: What scope and force should science have vis-à-vis other modes of thought such as social, political, religious, aesthetic and so on? Because the external perspective frames the internal perspective, the external perspective is the more fundamental. Using the context of Africa, this paper explores the external perspective on science education.

## What is school science for?

The answer to this questions seems so obvious. Many will be prepared to shout, “Science is the way of the future!” Indeed, the eminent C. P. Snow (1964, p. 10) in his discussion of the unfortunate disturbed relations between scientists and humanists saw fit to comment that, "It is the physicists who have the future in their bones." Moreover, this view is not confined to the West. Jawaharla Nehru similarly remarked that, "the future belongs to science and to those who make friends with science" (quoted in Hedrick, 1989, p. 334). Moving on to the African continent, Jegede quoted Babs Fafunwa (1967) saying something very similar, “If Africa is to

make progress in moving from the eighteenth century into the late twentieth century, unconventional approaches to science and education unprecedented in world history will have to be devised." Well we are now rapidly approaching the 21st century and Professor Sam Bajah recently found it necessary to sound the refrain once again. "Scientific literacy for all is therefore a **sine qua non** for living in the twenty-first century" (Bajah, 1995, p. 5-6). Uganda's visionary leader, Yoweri Museveni, identified five factors needed for Africa to assert itself globally. The factors included, "An educated population that will have the capacity to utilize technology in order to transform our natural resources into wealth" (Museveni, 1995, p. 55).

For better or for worse, the clear consensus is that science and technology are critically important for achieving and sustaining a desirable quality of life. More specifically, there is an emerging global economy, grounded in science and technology, that promises great material benefits. These benefits come in the form of expanded opportunities for one's life choices. Around the globe and across time, a child traditionally grew up to do only the things that his or her parents did - but that is changing. The benefits come in the form of opportunities for vastly improved physical health which includes nutrition and disease recovery and prevention. There is the mitigation of dangerous natural phenomena through superior building construction and early warning systems. And there is the benefit of environmental and biodiversity protection needed for the protection of future generations.

These benefits are not to be had without an appropriate foundation in morality, ethics, and freedom to be sure. It seems sure, however, that they also cannot be had without modern accomplishments in science and technology - science and technology are not in themselves sufficient to bring this good life, but by most accounts they are necessary.

## The Results to Date?

Jegede (1995) reviews science and science education in Africa and he is not terribly optimistic. I would only add that important recent accomplishments such as the 1995 Africa Science Teacher Educators meeting held in Durban, South Africa required the removal of that human blight called **apartheid**. Unfortunately, other blights await removal as the world was dramatically reminded last year by the regime sanctioned murders of Ken Saro-Wiwa and eight other Ogoni activists in Nigeria. My point is that **quality of life requires much more than science and technology**.

This brings me to my central interest in the **valuation** of (not **e**valuation of) and place given to science and technology as a sub culture within the greater domain of culture. In the West, science and technology have clearly come to dominate the worldview of **the political, media and economic** Western leadership. It is important to notice my qualifying adjectives "political," “media” and "economic" because there are large numbers of Western peoples especially in the USA who are greatly concerned with the secular materialist worldview of most political, media, and economic leaders. The eminent American sociologist and political commentator Peter Berger has wryly noted that if the Swedes of Sweden are the least religious people in the world and the Indians of India are the most religious people, then the USA is a nation of Indians governed by Swedes. We Americans are indeed an odd lot. In the current discussion, however, it is the public face of leadership that is of interest. Western leadership correctly views modern science and technology as essential to effective competition in the global economy. The American political and scientific establishment, however, inappropriately asserts this basic position much more strongly:

> In a nation whose people depend on scientific progress for their health, economic gains, and national security, it is of utmost importance that our students understand science as a system of study, so that by building on past achievements they can maintain the pace of scientific progress and ensure the continued emergence of results that can benefit mankind (NAS, 1984, p. 6).

In my opinion such an assertion crosses the line and science is no longer simply **necessary** for economic development and competition. The assertion of **dependence** suggests the level of sufficiency. This reasoning is consistent with what I consider the **Four Western Imperatives**.

1. The Imperative of **Naturalism** - All phenomena can ultimately and adequately be understood in naturalistic terms.
2. The **Scientistic** Imperative - Anything that can be studied, should be studied.
3. The **Technocratic** Imperative - Any device that can be made, should be made.
4. The **Economic** Imperative - Material well being of people is the highest good.

Moreover, as Michael Adas (1989) has shown in his book, *Machines As The Measure Of Man: Science, Technology, And Ideologies Of Western Dominance*, the West judges other people by their science and technology and implicitly devalues traditional modes of life and belief outside the modern, Western science and technology perspective on the global economy. Therefore, the West concludes that,

> From... the present state of interaction between scientific research and society, and from the definitions of underdeveloped countries and of cultural revolution..., there follows one basic conclusion on national policy: The building of scientific research in the less developed countries into a social force relatively as strong as it is in the developed countries must have, from the first, a priority as high as, for example, economic development... (Dedijer, 1962, p. 783)

## **An Unqualified *Good*?**

No. The emphatic science and technology perspective that Western leadership has on the global economy is not an unqualified good. The political, media and economic West's obsession with science and technology has significantly contributed to the serious erosion of Western society's moral foundation and frayed the social fabric that binds people together as a community, as well as damaging the natural environment on which we are all dependent. Science is a tremendously effective force that has come in the late 20th century to dominate Western public discourse - "unarguable and spectacular effectiveness is the ace up science's sleeve. Whatever else we may think of it, we have to accept that science works. Penicillin cures diseases, aircraft fly. crops grow more intensively because of fertilizers, and so on" (Appleyard, 1992, p. 3). People, however, are divided because something is missing. In 1959, the same year that the American poet e. e. cummings penned the lines,

> I'd rather learn from one bird how to sing
> than teach ten thousand stars how not to dance

C. P. Snow wrote of the science/humanities rift as having obtained the status of two cultures, and few disagreed. Snow's influence is such that it is axiomatic that anyone discussing problems between the sciences and humanities will invoke Snow's "two cultures" metaphor. Unfortunately, Lord Snow was more a symptom of the division than an evangelist of reconciliation. Snow fully accepted the positivist position that science is the only truly verifiable and self-correcting mode of inquiry. Lord Snow's concern was for the future. For him, it was not the humanists, but the scientists who "had the future in their bones" (1964, p. 10), and to scientists we must look. For Lord Snow, reconciliation meant the absorption of the humanities by the sciences - scientists know that science is rational, humanists only believe that the humanities are. One major consequence of this attitude is that there is in the West a rash of anti science activity (see Crease, 1989; Dyson, 1993; Gross & Levitt, 1993; Holton, 1993; Ruse, 1994). Moreover, the reputation of

science has been tarnished by association with manmade weapons of mass destruction and with ecological disasters. The situation is such that one leading commentator recently remarked that, "Far from a liberal end to history, science and secular liberalism are in retreat as the century winds down" (Appleyard, 1993, p. 52).

Similar adverse effects of science and technology are increasingly visible in societies seeking to enter the global economy. There is widespread, unwarranted disruption of traditional life. Millions of people have left agrarian lives for urban centers there hoping to find a better life in the modern economy. Too often they find conditions of poverty and squalor far in excess of the worst aspects of traditional agrarian life. Even when they stay at home, they may find that the modern economy has come to them, not with riches, but with pollution and environmental degradation and death. While in prison, Ken Saro-Wisa declared the plight of the Ogoni people:

> Ogoni! Ogoni!
> Ogoni is the land
> The people, Ogoni
> The agony of trees dying
> In ancestral farmlands
> Streams polluted weeping
> Filth into murky rivers
> It is the poisoned air
> Coursing the luckless lungs
> Of dying children
> Ogoni is the dream
> Breaking the looping chain
> Around the drooping neck
> of a shell-shocked land.

I thus wish to suggest that when one asks what is the appropriate knowledge base for learning in science and technology in Africa, one must keep critical issues clearly in focus. These at the very least include asking,

1. What are the reasons one has for doing school science and what indicators one will use for measuring, not just academic or economic success, but social success?

2. Are the **negative** as well as the positive experiences the West has had with science and technology recognized and understood?

3. Is there a recognition of the possibility that African, Asian, and Latin societies can glean the best that the West has to offer (political freedom in addition to scientific and technological accomplishment), while at the same time offering a perspective on the

global economy that values critical aspects of tradition and community?

It is with these thoughts in mind that I turn to the questions:

- Should Africa's aims and goals for teaching and learning science and technology be different in policy, orientation and implementation from what obtains in the Western world?
- Should a science culture in Africa be isomorphic with Western science culture?
- Should the world be moving toward, science based, cultural homogeneity?

I ask because many Western development experts in the 1960s (the same period when many of the current ideas about science education were formed) believed that science would help bring about a world culture. Dedijer (1962, p. 783) wrote:

> definitions of culture are based on the hypothesis that at present all cultures are evolving in a planned way toward a common world culture... a global civilization. Development then consists in carrying out with the aid of the outside world, but primarily by their own forces, a planned, rapid and simultaneous change of most complexes of their existing cultures in the general direction of the developing world culture.

Jegede (1995) adamantly rejects this view and I certainly concur for reasons grounded in the above discussion and exemplified by the plight of the Nigeria's Ogoni people. This rejection, however, raises the question of how science education can be viewed from an African perspective that would be an improvement on the way science is conceived of in the West.

Multiculturalists in science education often offer a view of culture and various disciplines and domains of knowledge based on Wittgenstein's theory of language games (WLG). A language game approach to science and culture, however, should be a matter of serious concern for anyone wanting to sustain the integrity of traditional culture while simultaneously embracing the important concepts of modern science. Let me begin with the British philosopher, Ludwig Wittgenstein, and his original idea.

> In the *Philosophical Investigations* [Wittgenstein] argued that if one actually looks to see how language is used, the variety of linguistic usage becomes clear. Words are like tools, and just as tools serve different functions, so linguistic expressions serve many functions. Although some propositions are used to picture facts, others are used to command, question, pray, thank, curse, and so on. This recognition of linguistic flexibility and variety led to Wittgenstein's concept of a language game and to the conclusion that people play different language games. The scientist, for example, is involved in a different language game than the theologian. Moreover, the meaning of a proposition must be

> understood in terms of its context, that is, in terms of the rules of the game of which that proposition is a part. ("Wittgenstein, Ludwig Josef Johann," Microsoft (R) Encarta. Copyright (c) 1994 Microsoft Corporation. Copyright (c) 1994 Funk & Wagnall's Corporation)

Applied in science education by multiculturalists, the idea is that one can simultaneously hold two or more contradictory views of a phenomenon because the different views are separated by the different "language games" from which the views are derived. In other words, just as one can happily have an apple **and** an orange (which are very different and yet both are fruits), one can also happily hold a cultural belief from tradition that is very different from a belief from science about the same subject. My assertion to the contrary is that this view of sustaining both traditional culture and modern science can only work in the short run. In the long run, one game will overcome the others. It seems to me that this is what has happened in the West as Western societies have moved from being **traditional** societies to so-called **modern** scientific and technological societies. My reasoning is as follows.

There is a limit to the number of scientific explanations (or concepts) one can have knowledge of and still have one's basic view of reality remain unchanged. Consider a traditional farmer in a non modern culture. The farmer might learn to use nitrogen fertilizer and learn some rudimentary scientific explanations as to how nitrogen works as a fertilizer. The farmer is not likely to change his thinking because chances are he uses some form of fertilizer to start with (e.g., cow dung). The scientific basis for using the nitrogen is an elaboration on his existing understanding. The farmer has practical knowledge which he employs but what he does not know about plant growth and food production is very large. Insecurity that comes of not knowing is eased by religion (by no means do I imply that religion is a "crutch" nor any form of "god-of-the-gaps" theology). The vagaries of plant growth and production are in God's hands. The more the farmer learns about plant growth and production and the more he can do for himself to insure a good crop, however, the less are the vagaries which tie him to his religion. His acquisition of "earthly" knowledge inevitably forces questions about the nature of his religion. His religious knowledge may become stronger or weaker (depending on the nature of his religion and whether or not there has been a fair engagement between the two discourses) but it will change as he accommodates his religious knowledge to his new scientific knowledge. It is also true, I assert. that he will accommodate his new scientific knowledge to his traditional views - but that is

another issue. Though different in degree, in essence this scenario differs little from classroom scenarios in the USA, the UK, or Nigeria, South Africa, etc. Scientific literacy at any non trivial level will bring about changes in one's basic understanding of the world, i.e., worldview. The problem of meaning in science education does not stem from change per se, but from unwarranted change based on one social construction of what science is all about that results in the loss of meaning. This is the scientistic construction that tacitly (if not explicitly) asserts that science explanations are exhaustive thus marginalizing all other ways of knowing. To some this is no problem at all. Any lack of interest in science or under representation is a sociological problem not a cultural one, i.e., more role models, scholarships, affirmative action, more rigorous curriculum, etc. For these people, science as it is now is unproblematic. The problem is getting more people into science. In this view, science has no cultural dimension, only a sociological one. I take the opposite view that the issue is **cultural** far more than **sociological**.

Some who agree with the cultural perspective, however, see Wittgenstein's philosophy of language games as a source of resolution. When I see language games in the science education literature it seems to be there as a way of conflict resolution. Students are introduced to science at school only to find it in conflict with traditional, ethnic, racial, gender, or religious based ideas. If we say that no base, that is that no epistemology, has objective access to truth then we can claim that each of these is an independent perspective that can only be judged within its own domain. This was Wittgenstein's argument. By thus route, the teacher can say to students that any conflict between science and culture is only **perceived**. The conflict is not real. A common example is to cite two types of **ball** games. For example, because cricket and football are played by different rules, what each has to say about a "ball" is true only within the rules of a particular game (i.e., cricket or football, but not both). Consider a second example. I could live (say) in Japan for a number of years and learn the Japanese language; and, it would be difficult to remain uninfluenced by the experience. What is important to see in this example, however, is that I would not need to become "Japanese" nor feel pressure to do so even though I had gained the ability to operate in both cultures, American and Japanese. In other words, I learned to move back and forth between the two cultures. This can happen because I know I can live in my own culture with no need of the "Japanese way," and when I travel to Japan, I can play the "Japanese" game. At home I play the "American" game. This is possible because quite literally people can

choose to have different social arrangements (e.g., self oriented vs. community oriented, monogamous or polygamous relations) and we can argue and persuade with each other over the merits of these different social arrangements. We can live and let live. And, we could call these **cultural language games**.

Turn now to the natural world which is of course the domain of science. **In contrast to social arrangements, people cannot choose different arrangements to have with the actualities of the natural world**. The actualities of nature occur regardless of people and their social and cultural arrangements. People accommodate differently to the natural world - there are pastoralists and farmers, scientific investigators, those who use technology to insulate themselves from nature, and those who passively accept the actualities of the natural world as part of the givens in life. By "accommodate" I mean how one makes room for the natural world in one's everyday thinking. Here I must emphasize that by "accommodation to the actualities of nature" I am not talking about different social arrangements that are self-contained. I am talking about different accommodations to the **same natural world**. Two people can stand at the same spot at the same moment in time and physically experience the same earthquake and come away with two very different accommodations to what happened. The accommodations are different but the earthquake is one thing. Because social arrangements are self-contained, conflict can be avoided (though clearly conflict still occurs). I can move back and forth across cultures so long as I am confident of my own culture. Accommodations to the natural world are by definition accommodations to the **same** actualities and thus conflict is unavoidable.

Some traditional Nigerian cultures consider the chameleon to be **evil.** In my own experience I saw students and faculty who basically did one of three things with regard to their cultural perspective on the chameleon vis-à-vis modern science. Some people simply rejected science as an alien entity that conflicted with what they knew to be truth. These include those who, according to Professor Bajah (1995, p. 4), call science "white man's lies," or *iro oyinbo*. Others learned as part of their science lessons that chameleons are harmless and not evil and could repeat this **scientific fact** on an exam. They simply boxed this off as yet one more piece of information that is needed in the school game but of little intrinsic worth elsewhere - and at least for them, of no threat to their cultural knowledge. Few science educators, however, would accept either of these outcomes as desirable.

The third group[1] has the appearance of a favorable outcome. It has the appearance of a WLG because these people both learn and use science - they likely are science majors or even scientists - but retain their cultural knowledge in a somewhat strained relationship with their scientific knowledge. This person is able to study modern ecology including the chameleon but still views the chameleon as evil. (Often such a person tries to hide his or her belief in cultural knowledge when around those outside his group.) Perhaps he won't touch a chameleon. Perhaps he will still kill them discreetly and when he has the chance. Neither is acceptable to his science studies but he gets by as a science student or even scientist because for the most part this bit of culture does not significantly intrude on his science endeavors. This is an example of a WLG. The point about this is that the language game cannot be played without tension because **the games are played on the same field**. In this example, the science culture game and the indigenous culture game are both about the chameleon. If collateral learning is interpreted as a WLG then it too would face this tension. The problem is that without some form of mediation or integration the tension is likely to be resolved in favor of the language game of modern, Western science. Recall Appleyard's (1992, p. 3, emphasis added) comment, "**unarguable and spectacular effectiveness is the ace up science's sleeve**. Whatever else we may think of it, we have to accept that science works. Penicillin cures diseases, aircraft fly, crops grow more intensively because of fertilizers, and so on." Moreover, one should not simply disregard the cultural view of the chameleon as superstition or an idle folktale. It is part of cultural teaching about morality. In this case the evilness of duplicity. Though one cannot know the details of how the association began, it is reasonable that the chameleon's deceptive behavior would be associated with duplicity. To the extent that science education disabuses people of the idea that the chameleon represents duplicity, it weakens the indigenous cultural fabric. It does this first by showing the indigenous culture to be in error (i.e., the chameleon is not harmful) and second by **failing** to replace the moral support (i.e., the chameleon as part of an object lesson on the evils of duplicity) it destroyed. Thus, my concern is that in the long run a language games approach to issues of culture and science will yield one of two unacceptable results. One is that traditional

[1] A very small fourth group eagerly embrace science as a way of rejecting their culture. They learn to disregard cultural teaching, sometimes even to despise it, because they learn from science that the chameleon is physically harmless. They see others handling the chameleon with no ill affect. They learn that the chameleon's ability to change colors is a natural adaptation to its environment that allows it to survive - it has nothing to do with morality. This group, however, is only of interest to those who have no intention of protecting traditional culture.

culture retains its integrity because science is learned merely as school knowledge. On the other hand, where science is learned as something more than school knowledge it will eventually undermine traditional culture by virtue of its sheer physical effectiveness. The latter is what has happened in the West.

The point of this discussion, using the example above, is that a science teacher should not shy from discussing the moral lessons traditional culture derives from observations of nature. Thus, while teaching the modern science of ecology, which would include the chameleon's role in nature and benefit to humans (as opposed to its perceived mendacity), the teacher would affirm an important contribution of traditional culture. The failure of science education to develop an environment where different traditional cultures and the sub culture of modern science can **meet in dialogue on an equal footing**, will lead to the advance of one at the expense of the other

**Discussion Questions:**

1. What would be the principle features of a science education policy written from within an African worldview?

2. How would this "Africanized" policy differ from "Westernized" policies one would encounter in the UK or USA, for example?

3. How might an "Africanized" science lesson differ from a "Westernized" science lesson or would lessons necessarily always be different?

4. What changes in African culture under the influence of science are warranted? What kind of changes are unwarranted?

## References


Adas, M. (1989). Machines as the measure of man: Science, technology, and ideologies of western dominance. Ithaca, NY: Cornell University Press.

Appleyard, B. (1992). Understanding the present - Science and the soul of modern man. New York: Anchor Books Doubleday.

Bajah, S. (1995). Goals and needs in science education - past and future. In A. Hofstein, B.-S. Eylon, & G. Giddings (editors), Science education: from theory to practice (pp. 3-6). Rehovat, Israel: Department of Science Teaching, The Weizmann Institute of Science.

Crease, R. P. (1989). Top scientists must fight astrology - or all of us will face the consequences. The Scientist, 3(5), 9 & 11.

Dedijer, S. (1962). Measuring the growth of science. Science, 138(3542), 781-788.

Dyson, F. J. (1993). Science in trouble. American Scholar, 62(4), 513-525.

Fafunwa, A. B. (1967). New perspectives in African education. London, UK: MacMIllan Education Limited.

Gross, P., & Levitt, N. (1993). Higher superstition: The academic left and its quarrels with science. John Hopkins University Press.

Hedrick, L. (1989). The several worlds of J. B. S. Haldane. The World & I, 4(12), 328-335.

Holton, G. (1993). Science and anti-science. Cambridge, MA: Harvard University Press.

Jegede, O. J. (1995). In Search of an Appropriate Knowledge Base for Learning in Science and Technology in Africa. Paper presented at the 1995 African Science and Technology Education (ASTE) Conference on African Science and Technology Education, Towards the Future: Practice, Policy and Priorities. The University of Durban-Westville, South Africa, December 4-9.

Museveni, Y. (1995). Does Africa matter? New Perspectives Quarterly, 12(4), 53-55.

NAS. (1984). Science and creationism: a view from the National Academy of Sciences. Washington, DC: National Academy of Sciences.

Ruse, M. (1994). Struggle for the soul of science. The Sciences, 34(6), 39-44.

Snow, C. P. (1964). Two cultures and the scientific revolution. Cambridge, UK: Cambridge University Press.