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Kwesi Kwaa Prah (Ed.)

# Culture, Gender, Science and Technology in Africa





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edited by

Kwesi K. Prah

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K.K. Prah (Edited)

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Kwesi K. Prah

## FOREWORD

This publication is the outcome of a workshop on; 'The Cultural Prerequisites and the Role of Women in the Application and Development of Science and Technology in Africa' held at the United Nations Economic Commission for Africa (ECA) in Addis Ababa from the 28th to 30th March, 1990.

The workshop was organized by the Science and Technology Section of the Natural Resources Division of the ECA in cooperation with the Education, Science and Documentation Centre of the German Foundation for International Development (DSE) and was the first of its kind in sub-Saharan Africa. It elicited a great deal of interest from both social scientists and policy-makers in charge of promoting science and technology in the region. The organizers are grateful to all those who contributed to the success of the workshop.

The objectives of the workshop were to create an awareness amongst policymakers and experts on the crucial need to consider cultural factors in the development and application of science and technology, to highlight the cultural role of women in the popularization of science and technology, to promote the utilization of indigenous knowledge systems and cultural media to propagate science and technology, and to organize an African forum on the theme of culture, science and technology.

Developments in science and technology are having a tremendous impact on the lives of African peoples and socio-cultural norms are being daily affected by new ideas and gadgets produced in the developed world. Indigenous development and the application of science and technology to solve the problems of basic needs are being hampered by many factors. Some of these factors have cultural dimensions.

Multiple technological and industrial projects have failed in the recent past because cultural factors were not adequately considered during their conceptualization and implementation phases. It is therefore necessary to highlight such cultural prerequisites so as to enable a greater degree of integration of modern science and technology into the daily lives of the African people. In this process the cultural role of women in the development, assimilation and preservation of certain values necessary for a stable though forward looking society, is to be emphasized since they form the backbone of our society, and are the main producers and distributors of food. There is need to create a scientific and technological culture that spreads right up to the village. There is need to demystify science and technology by bringing out the scientific basis of many traditional practices common in food habits, agricultural methods, ethno-medical systems, and healthy environmental adaptation practices, etc.

> Soodursun Jugessur (ECA) Wolfgang Gmelin (DSE)

## Approaches to the Integration of Modern Science and Technology into Traditional African Culture

Soodursun Jugessur

#### Introduction

Africa is grappling with problems of underdevelopment resulting from an underutilization of science and technology. Modern science and technology have shifted the comparative advantage of the earlier strong resource base, and African commodities are no longer fetching the foreign currency necessary for local development. On the other hand, traditional African culture is often a stumbling block in the assimilation and enhanced application of science and technology, essential tools for socio-economic development. It is recognized that efforts to industrialize African States have met with dismal failure because little or no attempt was made to consider the cultural prerequisites of such development imposed from outside. Etienne-Richard Mbaya [1] speaking on "African Cultural Identity: The Conflict Between Traditional Heritage and Modern Development", says:

How many unused dams exist? How many agricultural promotion programmes have been stillborn? Simply because the planning process failed to take account of this or that sociological feature, this or that historical factor, this or that tradition. He who fails to give consideration to cultural aspects in fact behaves like the colonial trader, whose one interest was selling his wares. Such a situation leads to the destruction, the ruin of African culture, and also to monologue in European culture in the form of a dialogue with the tropical version of its own carricature.

The superiority of western technology in terms of meeting basic needs and a higher standard of living, forces developing nations to depend on such technology, often with scarce attention to the development, upgrading, and exploitation of indigenous science and technology. The indiscriminate adoption of foreign technologies, without due consideration of local culture and tradition has led to multiple problems in the development process. It is to be noted that the technologies developed in the west are meant to meet the Westerners' own needs, and are seen to be appropriate to their socio-cultural norms. When transferred to developing countries, these socio-cultural norms are often absent or different in the new set up, and hence their assimilation is always a major problem. What should developing nations then do to prepare themselves for facing the inevitable advent of such technologies necessary for their own development? What are the cultural prerequisites for the development and application of modern science and technology? Is there any room for a closed-wall policy in this world of inter-dependence? These are the questions that will be addressed in this paper, while highlighting the different approaches to the integration of modern science and technology into traditional African culture.

#### The Changing African Cultural Scene

Traditional African culture englobes not only the fine arts but all human activities based on folk traditions, beliefs, and rituals that affect the daily lives of the people. Whether it is eating, working or sleeping, whether it is agricultural practice or medicinal cure, whether it is dress, dance, drama, music or sculpture, all these are part of African culture based on age-old wisdom and practice. This culture has necessarily been influenced by the tribal movements through war and conquests and through exigencies of natural calamities like drought and desertification. Since culture is never static, there is no reason why the advent of modern science and technology will not bring new changes necessary for the survival of the race. Any society that will try to close itself from outside influences will necessarily be marginalized and disappear in the course of time. Adaptation to new environmental impacts is a necessary condition for survival and growth. Hence it is necessary to find ways and means by which African society can capitalize on the advent of modern science and technology and use it to improve its quality of life. The pitfalls of industrial society can be avoided in this process, by a judicious science and technology policy that takes care of the environmental hazards created by indiscriminate adoption of technologies. At the same time, inherent African values can be preserved to some extent so that one is not completely uprooted and mentally colonized by a 'superior' exogenous culture. Klaus Gottstein [2] remarks that we should not encourage the disappearance of old cultures when such disappearance can be avoided, as they contribute to the richness of the human heritage. The impact of modern science and technology with their means of communication, however, is such that it is very difficult to preserve old cultures without any transformation. We should not be unduly dogmatic about the need to preserve fully all the aspects of culture, for change is a necessary condition of life.

#### **Approaches to Integration**

How can this change be brought about, so that African culture can, with minimal conflict, absorb modern science and technology to its advantage, and create an indigenous scientific and technological culture? Most of the methods enumerated below are of the domain of popularization of science and technology in the African scene, and this involves a process of education at all levels. The different segments of the society - children, women and men, both in the rural and urban areas, have to be educated by all the possible means available to the community.

The present systems of education have favoured the growth of an elitist class element in urban areas, a class that tends to decry traditional practices and a rural way of living, and that tends to emulate the Westerner in all his ways of thinking and living. Such a class controls the governmental machinery and directs the national resources to feather its own nest, much to the detriment of the vast majority of rural dwellers. Science and technology are exploited by this class only to widen the gap between the urban and the rural. Modern science and technology do not reach the vast rural masses who form the majority of the nation. Hence development, if at all, is minimal. It is then essential to change this trend by bringing the benefits of modern science and technology to the entire mass of people in the country, by a process of redistribution of wealth and by the provision of adequate facilities for education in the rural areas where traditional culture tends to inhibit any change and growth.

#### The Demystification of Science and Technology

Basic principles of science and technology are found in many of the traditional practices in the daily lives of people. These principles are however covered with a veil of mystery and magic, and few African scientists have attempted to explain their daily practices from a scientific standpoint. On the other hand, they have tried to implant western science in the schools from a western approach, without linking it to the surrounding phenomena, or to the activities in their daily life. This has only perpetuated the mystification of science and therefore the associated technology. The situation has worsened with the advent of new, improved technologies. The starting point for demystification of science and technology should be the teaching at primary and secondary levels of traditional science and technology so that pupils can grasp the fundamental principles much faster. Then they can apply the same principles while adapting foreign technologies to be adopted at different levels of the educational process.

#### **Primary and Secondary School Levels**

Most schools in Africa have introduced science teaching both at primary and secondary levels. At the primary level science is introduced as environmental nature studies, while at secondary level, the classical version of science subjects are introduced. In a few exceptional cases integrated science curricula have been able to inculcate the basic principles properly, as a practical, the teaching of science as a hands-on experimental approach, has been lacking due to a dearth of laboratory equipment. The fact that the surrounding environment provides adequate illustrative tools for transforming abstract scientific concepts into concrete realizations, has not been exploited. Nor has indigenous science and technology been brought out and highlighted to make the students understand the ideas in a concrete way. This depends very much on the initiative and drive of the teachers who are often not adequately trained. I once visited a secondary school where students were being taught, in a descriptive way, the physics and the biology of the eye. When I asked them whether they had actually dissected an eye, the answer was no. Yet every student could afford to get a bull's or a goat's eye from the town butcher. Nobody had thought of bringing one and use it, through dissection, to illustrate the abstract physical and biological concepts. Dozens of other examples can be cited to show that the teaching of basic science can be immensely improved by making use of surrounding illustrations available in the traditional life of the people. In the field of physics, the laws can be illustrated by taking examples of flying birds and running beasts, of cooking pots and evaporating pans, of ox-carts and bicycles, of hoes and crow-bars, etc. In the field of chemistry, instances can be cited of food fermentation, of alkaline soap and acid fruits of home-made plasters, etc. In the field of biology, examples are many. Ideas of plant growth and fertilizer usage, of the structure of the plant tissues and animal parts, of birds and insects can easily be illustrated to allow the children to grasp the concepts. The concepts should then be translated into actual practice in the homes. For example, a child can instruct his mother why it is important to boil river water before giving it to his baby brother or sister. Elements of hygiene are to be practiced both in the school and at home. A scientific culture can be imparted to the grown-ups through their children.

#### Use of Local Language

Whenever necessary, there should be free usage of local dialects and languages. Very often the teacher tries to inculcate new ideas using a foreign language, thinking that using the local dialect is humiliating. At times he is himself from another locality, and does not know the local language. The use of an appropriate medium of instruction plays a very important part in imparting the proper education to the children.

#### **Encouraging Girls to Take Science**

The development of a scientific culture starts in the schools and at the secondary level, African girls should be encouraged to take science subjects. Most often boys prefer science while girls take the arts subjects. Girls who will become mothers and householders later on, need scientific concepts in their lives. Hence, right at the secondary school level, more and more girls should be encouraged to take science subjects, and to give up their prejudices against science education. Why shouldn't African girls become scientists and engineers in larger numbers? Taking science subjects should not be seen only as means to a profession, but as a means to develop a scientific and technological culture necessary for a wider development and application of science and technology.

#### University Education and Research on Traditional Science and Technology

Once a proper foundation has been laid at the secondary school level with appropriate teaching of science and technology using environmental tools and suitable laboratory equipment, university science education can improve immensely. University graduates in science and engineering will have grasped the basic principles and will be able to apply them in their daily lives. The chemists, the physicists, the biologists, engineers and agriculturists, should have acquired the basic know-how to find gainful employment not necessarily in government service. The private sector can employ them, and the growth of the private sector will depend on the graduates themselves taking self-employment and starting small and medium-scale enterprises and industries. This should be the primary objective of university education in a developing country.

For those who go for post-graduate work and research, they should be encouraged to do research on traditional science and technology with a view to demystifying existing traditional practices. By so doing, they will upgrade traditional science and technology, and give a sense of self-confidence to their people. Ethnomedicine, ethno-psychiatry, ethno-botany and ethno-zoology, should be given high priority in university curricula and research, and the results of research should be disseminated among the masses so that they realize that science and technology are not completely foreign to Africa.

For years now African universities have done research on traditional pharmacopeia. Multiple research papers and books have been published. But the common man has not gained an iota from this research. How can we then develop a scientific culture? Is it not time the results of the research are explained to the common man? The problem is that inspite of university education, the eyes of our academics are still glued towards western science and medicine. And to make it worse, our policy-makers prefer to get free or cheap medicine dumped in developing countries by international organizations working for strong multinationals, without realizing that such free or cheap medicines (often outdated) will only stifle the local entrepreneurial spirit to manufacture medicines.

To avoid such a situation, African universities should be primarily developmental universities, where teaching and research should be aimed at meeting local developmental needs. We should not train chemists, doctors and engineers for the developed countries of the west. Even if it means' lowering' standards as compared to western standards, we should give appropriate education to our university graduates who can utilize their knowledge fruitfully in contributing to local development, and in finding solutions to local problems. We have so far measured academic standards by the number of publications a researcher has made in foreign journals. Such publications have hardly contributed to alleviating local problems. It would be better to recognize our scientists and technologists who publish even in the local newspapers or magazines, but whose publications have a direct bearing on alleviating local problems. And those scientists and technologists who succeed in getting their results commercialized through local enterprises need to be awarded the highest distinctions in a developing country. This alone will give selfconfidence to our scientific and technological community, and help to integrate science and technology in our culture.

The university should be a center not only of learning, but also of collaboration between the local enterprises and the scientific community. Industrial parks within university campuses will encourage applied studies. These industrial parks will bring together researchers, technologists, entrepreneurs, and financiers who can take any innovation and bring it onto the production line. Modern science and technology will then be integrated into the fabric of society.

#### **Rural and Urban Youth Science Clubs**

In most countries where youth clubs are found in the rural areas, they are mainly sports and entertainment clubs. There are hardly any science clubs. Science clubs are very important for they can enable the youth to practise the science they learn in schools, outside school hours. Radio-amateur practice, video-games, scientific farming, home-science, tool-making, animal-training, and a host of other activities can be practised in such rural and urban young science clubs. Organized competition will also motivate them to improvise, innovate and develop their talents. The school teachers living in the vicinity should sponsor such clubs, and with the support of the community, popularize such clubs throughout the country. Science and technology will then not be contained within the four walls of the classroom. Conscious efforts must be made by the responsible members of the community to encourage such clubs that can develop a scientific culture amongst the masses.

#### **Radio and T.V. Programmes**

Radio and television are powerful tools to educate the masses, and to create the society we desire. If science and technology are to be integrated in our traditional culture, they should be given adequate time in our broadcasts. In Africa, radio has reached the far-away villages, and this is where successful programmes can be very effective in inculcating a scientific culture. The usual traditional radio programme consists of local or foreign music, or political propaganda. Very rarely do we have a science programme in the local dialect. Since the radio broadcast reaches the young and the old alike, the men and the women, basic science and technology education can be imparted in the local languages so that even the illiterate can assimilate elements of science and technology. Programmes should place emphasis on local endogenous science and technology, on the upgrading of their traditional practices using modern science and technology, and on occasional foreign programmes garbed in local language so that the people are made aware of developments outside. Heavy financial investment is needed by governments to enable the production of such programmes. It is easy to fill the broadcast time with cheap readily available tapes from the western media, but these will not help in creating a local scientific and technological culture. Local producers, mass-media technicians and specialists need to be trained. The number of scientific programme producers has to be increased, broadcast stations and networks have to be multiplied, to cover the length and breadth of the country. Where possible, private radio transmitting stations have to be encouraged. As long as radio as a medium of instruction, stays in the hands of a minority elitist group, there can be no hope for creating a scientific and technological culture amongst the people. The same applies for television broadcast, though the latter has its place mainly in the rich urban areas. These days, video recorders and players are being increasingly used, and governments should not restrict the purchase of such gadgets through heavy taxation, as they can contribute immensely to popularize science education in the rural and urban areas.

For those who have access to T.V. programmes, the introduction of science

programmes in local languages, depicting current developmental issues like health, sanitation, agriculture, farming, animal husbandry, building and construction, use of chemical and biological fertilizers, hybrids, post-harvest storage, food processing, bicycle and tool repairs, chicken and pig rearing, etc., can be very effective in creating an understanding of science and technology applied to the environment. Here again the increase in T.V. networks and T.V. channels requires extra resource allocation. Such resources are available only if the policy makers are keen on spreading the network throughout the country. Unfortunately, this is not always the case for the deep interiors of African countries still have little access to the available means of communication. When the villagers come to the towns CERIST and cities, it is a cultural shock they have to bear. A highly placed official in a city in Central Africa once related how his uncle from the village visited his house in the city. He was sitting in the drawing room when the T.V. was turned on. The announcer was talking in a foreign language and looking at the uncle. The latter could not understand from where the intruder had entered the box, and why he was facing him and talking to him in a language he did not understand. He felt perturbed and embarrassed, and was ready to leave the house when my friend intervened, and explained to him what the television was! This happened in the 1980's! Naturally, such a shock could have been avoided if the local radio programmes had prepared the uncle on what he could face in cities. **Exhibitions, Competitions and Prizes** 

Roving exhibitions which enable the organizers to move printed materials, charts, equipment, gadgets, and specimens, with the possibility of demonstrations and talks, are very effective in educating the people. Appropriate technologies can be popularized and transferred through such exhibitions in different parts of a country. Local competitions can be organized to bring out the budding talents. Innovations from schools, colleges, local craftsmen and technicians, engineers and manufacturers, can be exhibited, and the best ones rewarded through prizes. Such exhibitions and competitions need to be organized regularly, and become part of the culture of the people. Local folk learn a lot by seeing and often handling things that can affect their lives positively or negatively. The local market place is suitable place for such events, and is likely to attract many people from the surroundings. It should be the responsibility of village leaders and chiefs, district commissioners and representatives to organize such exhibitions and competitions with the support of the scientists and technologists in the country. Once again, as long as science and technology stay within the walls of schools, colleges, and universities, their impact on the masses will be marginal, and no scientific and technological culture can be inculcated in a traditional society.

When it comes to raising funds for the organization of such events and the provision of prizes, it is always possible to find some wealthy businessmen or agriculturists who are eager to see their names published and their contributions recognized. What is essential is a group of dedicated individuals who have to run around to carry the message and influence the potential donors. If such persons get the patronage of the local authorities, politicians and chiefs, the task becomes easier. Science and technology activities should find a place in the lives of all categories of people concerned with the socio-economic and cultural development of the country.

#### **Community Centres and Village Councils**

In any organized society, community centres and village councils are the meeting grounds of development workers. Such centres and councils need to be created where they do not exist, and be strengthened where they do exist but are inactive. Through such centres and councils, science and technology can be propagated by organizing talks, exhibitions, competitions, implementing micro-projects using science and technology for the welfare of the people, and thus developing an appreciation of what science and technology can do to improve the quality of life of the inhabitants. Since such centres are mostly run by the influential people of the locality, their own interest in science and technology will be roused by such events and activities, and integrating a scientific and technological culture amidst the masses will become easier. Local politicians even at the village level, have to show evidence of innovative approaches, and science and technology offer them this opportunity. Gossip and back-biting as undesirable aspects of local politics will yield to constructive activities that can have a greater impact on the people who elect them. Community development projects can benefit immensely from the introduction of modern science and technology, and traditional practices can either be upgraded or replaced by more efficient technicians.

#### Songs, Folklore and Plays

Traditional songs, folklore and plays have been instrumental in carrying particular messages to the people and in fostering any culture. A scientific and technological culture can also be fostered through such vehicles. Those who watch western television serials for children, are surprised at the number of examples of modern science and technology introduced in the programmes. Concepts of space travel, for example, are inculcated at the very early stage of a child's education. Why should it then not be possible for us to introduce basic concepts of science and technology through our songs, folklore and plays. The usual theme of an African song is love or marriage. The usual theme of folklore is the local social problem depicted in a picturesque way. Even the local dramas and plays stress socio-political issues. These cultural vehicles are very powerful in educating a people, and can be utilized to introduce scientific and technological knowledge to the masses through songs, folklore and dramas. Is it not possible to introduce techniques of biogas-digesters or solar driers, or agricultural production through similar songs, folklore and dramas?

The community development workers can capitalize on such vehicles to take their new ideas to the people. Educated people in a particular locality can also encourage the local singers and drama producers to introduce concepts of science and technology in their programmes. For the appeal is not only to the emotions but also to the intelligence of the people. Instead of the usual table and chair, or the flower pot on the table, laboratory experimental equipment, or biological specimens, or micro computers could form the decor. The theme could be the village budding scientist finding a cure for dyspepsia or meningitis. Instead of the lamentations of love loss in a local song, one could have the eulogy of scientist who has made a better bread, or produced a better seed. The folklore could relate the story of the village school boy who went to the university and invented the machine that could do the work of a hundred hands. Thus songs, folklore and plays can contribute to the development of a scientific and technological culture in the people. There is no dearth of new ideas and approaches.

#### **Dress and Behaviour**

The scientists and technologists who have been educated in urban areas tend to adopt western life styles and outlook, and automatically alienate themselves from the vast rural masses who still follow traditional customs. When such people try to educate the others round them, especially in the rural areas, there is either an aura of distant admiration from them, or a mistrust for exogenous elements. Their dress and behaviour have to be in tune with those of the local folk so that they can find a place in the hearts of the people. Creating a sense of mutual trust is essential, and the dress, the behaviour, the language and the expression, all contribute to the effectiveness of imparting a particular education to the local folks. For a farmer to adopt a particular technique in his field, the extension worker must come down to his level dip his hands in the soil, and speak the dialect of the man. The colonizers of yore transferred very little scientific knowledge to the people, for they could never integrate into their culture. We have to stoop in order to conquer. And the conquest here is the imparting of a scientific and technological culture to people who have for millennia followed a traditional culture which has kept them at sub-

#### **Food Habits**

Western education has also contributed to changing our food habits. African staple foods are rapidly being displaced by western style foods. In many countries, local production of staple foods has given way to imported cereals, often dumped as food aid. Rice used to be the major food in many parts of Senegal. Now French bread has found its way to the remotest village, and the people are dependent on imported wheat. Although local food had its own value, science and technology were not used to upgrade their quality, and since vested commercial interests have had the upper hand, the food habits of the people have changed.

The things people eat, and the way they eat them form part of their culture. If we want to impart a scientific culture to these people, it is necessary to bring out the plus points in their food habits, upgrade the technologies where necessary, and make them feel proud of their heritage. In Ethiopia, biotechnology has been practiced for millennia in the making of the 'ingera', a local pancake. While the fermentation process is still the same, new cooking stoves and electrical injera-making hot plates have been developed, thus upgrading the traditional practices, and not-supplanting them by introducing new food habits. When people are taught the scientific basis behind their traditional practice, they develop a sense of self-confidence and it is then easy to make them assimilate new scientific ideas and technological processes. Throughout Africa, the food habits of the people offer an open field of research whereby one can integrate a scientific and technological culture into the traditional culture. The same reasoning applies for traditional medical practices as well.

#### **Political Patronage**

For a scientific and technological culture to develop and flourish, political patronage is essential. African leaders have recognized the importance of science and technology as an essential tool for development, by adopting the Lagos Plan of Action [3], but have, in most cases, paid lip-service to their development and application. The resource allocation for this intersectoral field has been far from the targets [4]. Scientific and technological institutions have been created, but have not received the necessary tools to enable them to function properly. National priorities have been very different from what one would have expected in order to meet basic needs. In those countries where science and technology have been integrated into the local culture of the people, the heads of State and government

have personally taken up the stewardship of science and technology programmes. This is the case in the newly industrializing countries of the east. Unless science and technology receive the patronage of politicians and policy-makers, their development and application will always trail behind, and any approach for integrating modern science and technology into traditional African culture will be futile. Consequently, development in all its aspects will not be possible, and Africa will remain for centuries, the least developed continent on the globe, ever stretching its arms with the begging bowl.

#### Conclusion

While enthusiastically trying to integrate modern science and technology into traditional African culture, one has to guard against the negative consequences of a rapid integration. The most obvious is the disruption of families, communities, and the break in the effective bond that has kept the traditional society together. There is need to find an acceptable blend so that the positive elements of African culture can be preserved, with scientific and technological progress. Some sacrifice is inevitable. But we should not allow ourselves to be led to acculturation which can only destroy our personality and lead to mental imbalance and dependency, while creating slums, overpopulation, deforestation, and hunger. We should guard against the environmental pollution problems which the west is facing, because of overexploitation of natural resources and excessive industrialization.

We should guard against the excessive materialism [5] that has crept into wealthy societies, and where the human spirit lives but for the ego, where fellow-feeling is measured in terms of dollars, and where the old and the sick crave for a heart-to heart greeting from the passer-by. There are values that Africa has to preserve at any cost, and still be able to cope with improving the quality of life of its people through a rational application of science and technology integrated into the traditional culture. Unless conscious and deliberate steps are taken to integrate modern science and technology into traditional African culture, there will be no progress on the African panorama.

#### Notes

1. E.R. Mbaya. African Cultural Identity: The Conflict Between Traditional Heritage and Modern Development. In *Cultural Development, Science and Technology in Sub-Saharan Africa*. Klaus Gottstein, Gotz Link (Eds.) - Baden-Baden: 1986.