Science Education International
Vol.20, No.1/2, December 2009, 5-24

International Council of Associations for Science Education

Strengthening peace building through Science and Technology education

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Received August, 28, 2009; December, 2, 2009

Abstract
One of the many causes of conflict is the inequitable distribution of resources which is usually accompanied by widespread poverty. The breakdown in communication, the absence of a culture of peace is also contributing factors to conflicts. This paper has highlighted the causes of conflicts, the requirements for peace, and the strategies for peace building. It shows that there are many peace building actions that require inputs of science and technology. Such inputs would include scientific knowledge, the application of the knowledge and the process used in acquiring scientific knowledge. These three aspects of science and technology can influence the socio-economic development, poverty reduction, communication and dialogues in communities and the mindset that promotes peace.

Key words: *Peace building, culture of peace, socio-economic development, poverty reduction, science and technology education*

Introduction

All over the world there is a strong interest in the promotion of sustainable development. The global society wants an economic development that gives the present generation reasonable services and comfort without sacrificing those for future generations. In most countries, especially in Africa, this important goal is constrained by many factors which include conflicts, global change and poverty. Global change groups together the effects of the population changes, climate change and the accompanying environmental disasters like famine and floods. All these challenges are human induced or can be controlled by appropriate policies and actions. Furthermore they are inter-related, sometimes feeding on one another. Any of then can destroy all the factors of production and lower the economic growth rate.

This paper addresses one of these challenges: conflict, the prevention conflict and post-conflict restoration and the role of scientific and technical knowledge in the process. Conflict adversely affects sustainable development in many ways. First, it destroys the human resource base. During conflicts several people including children are killed. An even higher number of people die later

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from hunger, disease and malnutrition that are a result of the disruption of food supply. In addition the flight of qualified personnel to safety in other regions also weakens the human resource capacity. Conflict also adversely affects the national infrastructure and the environment both of which are usually considered as military targets or part of the strategy for the prosecutions of the war/conflict.

In general all economic activities are adversely affected. It is estimated that there is a drop of 2.2% points (OECD) from the GDP growth rate in each year of conflict. The political climate is also poisoned. There is a general mistrust, suspicion and lack of confidence among various political, ethnic and other groupings. All the indicators for social development decline. The infant mortality rate increases. Health care collapses. Access to potable water declines and there is increase in frequency and number of disease epidemics.

Once a conflict takes place the society is completely destabilised and there is need to rehabilitate through a set of actions, predominantly diplomatic and economic, that strengthen and rebuild governmental infrastructure and institutions in order to avoid relapse into conflict. This is the peace building process. It requires understanding the causes of conflict, the identification of the requirements for peace, and the actions to achieve the peaceful status. This paper will examine the role of science education in the peace building process. It begins by identifying the thematic group of actions frequently employed in peace building and proceeds to show the role that scientists, scientific knowledge and scientific process/ method can play in peace building. What we hope to achieve in this paper is to closely examine the strategies and actions used in peace building and show where and how science can improve their effectiveness.

Causes of Conflict and Requirements for peace

In the last decade many conflicts have erupted all over Africa. Countries which have known different types of conflicts include: Sierra Leone, Liberia, Cote D'Ivoire, Guinea, Eritrea, Ethiopia, Somalia, Uganda, Sudan, Kenya, Rwanda, Burundi, Congo DR, Congo, Angola, Senegal , Guinea Bissau. A significant number of countries are in post conflict and rehabilitation phase and are implementing several Peace-building actions.

Almost fifty percent of countries in the region have had some type of violent conflict in the last decade. These include full-scale armed conflicts, military occupation, and popular rebellion. Most of the conflicts can be described as "political violence" and come in different categories: Those arising from imposed societal inequities in resources and power (i.e. structural political violence arising from poor economic and political governance) ; militarization and war (combative political violence) ; political assassinations, torture, disappearances, detention and harassment (repressive political violence) violence against the state in the form of coup d'etats, guerrilla war fare and revolutionary forces (reactive political violence) (Zwi & Ugalde, 1989; 1991).

By far the most common type of violent conflicts in the world today is low intensity conflict which is deep-seated racial, ethnic, and religious hatreds combined with structural cleavages and political oppression that result in the victimisation of one or more groups through the denial of their fundamental needs (Fisher, 2009). Several African conflicts fit very well this global characterisation. In the continent, the denial of fundamental needs referred to, include: the inequitable distribution of wealth and widespread poverty and the denial of human rights. The frequency of reactive political violence (in form of coups and guerrilla warfare) also suggest a

breakdown in communication and an absence of dialogue among stakeholder and the existence of a culture of war (as opposed to a culture of peace). The existence of any of these negative factors in society is likely to lead to conflict. This is even more so if the victims of these negative factors are drawn mainly from certain ethnic or regional groups.

Poverty and inequitable distribution of wealth play a major role in most conflicts. It creates resentment of those who are well-off. It generates a lot of anger and hatred in society. It diminishes the Poor's respect for institutions and property. It dis-empowers the afflicted and reduces their access to justice. It diminishes their self-esteem. And when a group of individuals losses all these abilities and all powers to regain them, they become hopeless and eventually resort to violence because it is seen as the only solution available. If the lines separating those who are poor and those with wealth coincide with those of the ethnic or regional divisions, it creates an atmosphere for conflict. Most of the conflict that may be construed to be political are really fight over resources (jobs, tax revenues, infrastructural developments etc). It is not uncommon to hear politicians say "it our group's turn to provide leadership". The intention that really lies behind such statement is access to and control over the national cake/ resource. When there is resistance from another group to this take –over of political power (actually economic resource), conflict ensues.

The denial of human rights is one of the root causes of conflict in most societies. In many countries in Africa were conflicts have occurred one can identify many historical injustices that denied some of the citizens their basic rights. The absence of the rule of law arising from a weak judicial system that is not truly independent of the Government is one of the factors that create an atmosphere conducive to violent conflicts. In a situation like that citizens will not be able to expect justice from legal actions against the state when their rights are violated and security forces can engage freely in the abuse of human rights.

The lack of respect for the fundamental rights such as the right to vote, freedom of speech and assembly also promote conflict. Several countries emerging form conflict have had prohibitions against meetings/ gatherings of people in excess of a particular size, have failed to conduct free and fair elections and suppressed any political opposition to the Government. Other violations of human rights include torture and illegal detention.

The break down in communication makes it difficult for the conflicting parties to understand each other's traditions, cultures and intentions. Very often conflicts arise as a result of misunderstanding that would not exist if there is communication. The existence of good means of communication and dialogue ensures that disputes are settled before they transform into violent conflicts. Dialogue between people of various ethnicity or opposing groups can lead to deepened understanding and help to change the demonic image of the opposing groups. In Africa, most of the inter-ethnic conflicts have arisen out of negative stereo typical views of the opposing groups which sometimes create fear and mistrust. It is an established fact that throughout history ignorance (and in some cases contempt) of other cultures have led to conflicts.

Several countries have a culture that promotes war (a Culture of war). To understand what a culture war is, it will be useful to make comparison with a culture of peace.

- A culture of war is characterized by secrecy and propaganda. A culture of peace on the other hand assures a free flow of information through freedom of the press and freedom of expression. In Africa there are several countries where freedom of the press is not guaranteed. In these countries it is very risky to be a journalist. Such countries are practising acts that will promote a culture of war.

- A culture of war encourages the exploitation of people while a culture of peace allows all to enjoy their human rights. One can identify several countries in Africa where there are exploitation of groups of people (women, ethnic or racial minorities)

- The difference between the two cultures also lies in the way nature and the environment is treated. A culture of war selfishly exploits the nature while a culture of peace promotes sustainable development.

- Another difference is that the culture of war is characterized by use of power arising from the monopoly over force while the culture of peace is characterized by dialogue based on logic rooted in education. Dictatorships tend to rely on force to keep the citizens in check. Such countries are in effect in a culture of war.

- Finally a significant difference between the culture of war and peace is found in the way the former perpetuates male dominance while the latter promotes equality of women and men.

Following from the above discussion of the causes of conflict one can identify the following requirements of peace: socio-economic advancement; Intercultural dialogue (communications); a culture of peace and the enjoyment of human rights and justice by all. Socio-economic advancement is absolutely necessary in order to reduce poverty and minimise the competition for scarce resources. However it must be emphasised that economic growth, though an important requirement is not sufficient to overcome widespread poverty in society. In Africa for the poor to advance they need a poverty reduction strategy that includes: Investment in agriculture; creating employment; building infrastructure, support for the private sector and social protection. It is obvious that all these action, except the last one, require scientific and technical inputs.

Peace Building strategies and Actions

Peace building work focuses on reducing or ending violent conflict and the promotion of a culture of peace. Thus the strategy used focuses on changes in both the mindset and the social and political structure of society. The significant role that the change in the mind set can play in any peace building strategy was recognised long ago and it was for that reason that UNESCO was established by the global community to assure peace through education, science and culture. In fact the preamble of the UNESCO charter reads “since war begins in the minds of men, it is in the minds of men that the defences of peace must be constructed”. This profound strategic statement was obviously motivated by the belief of the founders of UNESCO, that, “a peace based exclusively upon the political and economic arrangements of governments would not be a peace which could secure the unanimous, lasting and sincere support of the peoples of the world…peace must therefore be founded, if it is not to fail, upon the intellectual and moral solidarity of mankind”.

The need for social and political structural changes as a peace building strategy was demonstrated earlier in the discussion of the causes of conflict where it was shown that denial of needs was the main cause of conflict.

The peace building strategy must concentrate on the core problem that created the conflict. It must therefore examine the political, social and economic conditions and identify those aspects of the structures that should be changed in order to maintain durable peace.

Unfortunately, however, most peace building programmes tend to concentrate only on efforts to change the political and social structures that created the conflict. Thus the focus tends to be on election reform, good governance, power-sharing initiatives and establishment of mechanisms to monitor and protect human rights.
Other issues relating to economic transformation (changes in the economic structure) are not addressed with the same level of interest. Yet economic advancement is the most important pillar of sustainable peace and it in this particular area that science and Technology play an important role in peace building. Science can be an important tool for peace building by enhancing income generation activities such as agriculture and small scale industries with the objective of reducing poverty.

Relying on this strategy, the following actions are undertaken in most peace-building programmes: Socio-economic development; Good Governance; Performance of justice and security institutions; culture of truth, justice and reconciliation and peace education. These actions together will ensure the fundamental causes of conflict are addressed. Obviously, science education can not contribute to all these actions. Actions that fall in the domain of structural changes in the political and social structures will obviously require very little scientific input. However science and technology can play significant roles in the successful execution of those that will lead to socio-economic advancement.

Science and technology education
Science is a body of knowledge. But this is not just any knowledge. It is knowledge obtained through study, practice or what is referred to as scientific method. This method relies on observation and experimentation to describe a natural phenomenon. Hence when we talk of science we are referring to a system that comprises content and process. Technology is the application of the scientific knowledge. Thus when one is examining the role of Science and Technology in peace building actions, one is looking at the content, the process and the applications of science.

The concept of scientific knowledge and the admissibility of a body of knowledge as modern science has always been a monopoly of the western world. There was no dialogue on the issue of what is scientific knowledge until recently when the west realised that there is vast resource base of knowledge in other civilisations. A true dialogue is now emerging leading to the promotion of Indigenous knowledge. Thus, scientific knowledge that can be used in peace building should not be restricted to western (laboratory -based) knowledge but should also include other knowledge which are also acquired through a process of experimentation and observation.

Science education is the field concerned with the sharing of science content and process within the community. It is an education discipline to promote the spread of scientific knowledge

beyond the existing scientific community. Through Science education it is possible to popularise science. The field of science education therefore emphasises the science content and the teaching pedagogy.

Furthermore, it can be said that Science education generates the human resource capacity for the application of scientific knowledge. Hence the application of science to the resolution of societal problems cannot take place without strong science education.

In order to understand the role of science and technology education in peace building, we must therefore address the question: How does the sharing of scientific knowledge, method and application facilitate peace building? The answer to this question will come from the recognition of the three major attributes of science (as knowledge, as a process, as a mindset) and the recognition of the role of technology in providing goods and services for society. Science education populates society with scientists who can apply scientific knowledge to socio-economic advancement. Since one of the requirements for peace is socio-economic advancement, Science education can facilitate the peace building process. In the next section we shall give examples of how science aids development and peace building.

The study of science imbibes in the population scientific reasoning that is based on logic. The scientific method used in gathering knowledge is based on analytical process that relies on logical arguments which will be a useful quality in dialogue among communities. In section 7 we shall discuss science as a facilitator for inter-cultural dialogue. Science also provides an analytical system that can be used in problem solving. It transforms attitude and the mind set.

Attributes of Science and technology that are important for Peace-building programmes
After analysing the strategy for peace-building and a closer examination of all the attributes of science and technology, the following aspects of science are considered useful in peace-building programmes:

- Scientific knowledge
- Scientific process (experimentation and observation)
- Scientific mindset (logical and analytical arguments)
- Science in application, as tool for change and progress.

These attributes of science will be deployed in three strategic actions for peace-building: Socioeconomic advancement; Communication and inter-cultural dialogue and peace education.

Science and Socio-economic advancement
Several conflicts arise from disputes over the ownership of limited resources. It is not surprising therefore that most of the very poor countries or regions are the ones which are embroiled in conflicts. Thus, if one wants to build peace one must start with activities that will facilitate socioeconomic development. When there is increase in resources and there are adequate services available and also an equitable access to the same, the possibility of conflict is minimized hence the main contribution of science and technology to peace building is to increase income, wealth and services for all.

There is evidence from history which is well documented in the literature to confirm that the income level of the developed world increased several times as a result of introduction of

technology. Furthermore, in addition to the purely quantity economic indicators other factors such as longer life, greater social protection , health service, education level and more rapid means of communication accompanied the growth in income. Thus, Science and technology affects not only the economic prosperity but also transforms the social structures, modes of behaviours, attitudes of the mind and also the level of tolerance which improvement in education will bring. These are important Social changes all which should strengthen the peace building process.

In peace-building programmes socio-economic advancement is pursued through actions that generate employment and income and create an enabling environment for economic activity. The latter will include development of infrastructure. As an important factor in production, Science and Technology increases productivity, production rate and income whenever it is introduced in an operation. In peace building some of the actions used for socio-economic advancement include support for agricultural; activities, support for micro-enterprises including food-processing and post harvest activities. All these activities can be enhanced through scientific and technical knowledge and skills.

In many post-conflict countries the development challenges are many and include: access to drinking water; support for agricultural research to help reduce hunger and poverty; improving child health and reduction of child mortality; promotion of microeconomic reforms to stimulate the private sector growth and employment creation. Science and technology can play significant role in overcoming all these challenges. For instance scientific knowledge is required in the search for water resources especially in cases where the source is underground. Technology is also required for the extraction and processing of the water. Similarly scientific research and development can lead to the enhancement of production and productivity in agriculture. New high-yielding variety can be identified through research. Farming techniques can be improved through inputs of science and technology. Furthermore other technological inputs such as fertilisers and machines can also improve agricultural output.

Science, Technology Communication and inter-cultural dialogue

Some of the Conflicts have their root in mistrust of each other, lack of respect for each other's knowledge and values, leading to the exclusion of knowledge and values from other cultures. It is an established fact that throughout history ignorance (and in some cases contempt) of other cultures have led to conflicts. A proposed solution to these problems is the promotion of dialogue among civilizations and cultures. In recent years this issue has taken centre stage especially in conflict resolution and the promotion of peace. Through dialogue it is possible to assure peace, tolerance, cultural diversity and promote development.

How can science promote dialogue among different cultures? Science can be a witness in any dialogue. Scientific evidence is sometimes crucial in resolution of disputes, mistrusts and terminating the blame-game. In some cases attempting to hold a dialogue, will be futile without such evidence. Science has over the years earned the respect of been factual. In some societies confidence in scientific evidence has reached a point of religion where people believe even without understanding. This respectable position enjoyed by science enables it to be a valuable arbiter in dialogue among civilizations.

There are several issues of global concern, with potential for conflict, that require discussion based on scientific evidence. Often these discussions require detailed knowledge of the interaction between man and its environment. Science provides the basis of such discussion. For example discussion on climate change and the role of various countries in the depletion of the ozone layer can only progress effectively if there is sound scientific evidence to inform the discussion. Similarly at national and regional levels, disputes over access to water resources are being increasingly discussed through dialogue in scientific communities. Science can provide the hydrological map to support decisions and policies for sustainable management of the resource and therefore prevent conflict.

Science enriches dialogue. The latter is empty without knowledge and Science is part of the knowledge base of any society. Every society has its views of nature. That is science. It provides the content and the language of dialogue.

Scientific community can provide a forum for dialogue. Through out history science has progressed through dialogue because the creation of knowledge occurs through exchange of ideas, facts and theories. The search for scientific knowledge has often led to dialogue within the community which normally cuts across several cultures. Hence the scientific community has been a centre for dialogue and can therefore play an important role in the promotion of dialogue among different peoples. Over the years the scientific communities have put in place several mechanisms for exchange of ideas which could be used as vectors for dialogue. These include networking, publications and dissemination of information and exchange visits among scientists.

Technology which is an application of science can also facilitate dialogue in case of conflict. Since dialogue thrives through communications, then recent advances in communications technology should help the process. The emergence of Information and Communications Technology (ICT) has made all forms of communication easy and fast. Hence ICT in particular has facilitated dialogue.

Science and the culture of Peace (Peace education)

Recently, peace education has become a strategy for peace-building. The goal of peace education is to imbibe in the population a culture of peace.

Through peace education activities the population will acquire the following values and attitudes

- Respect for life, end to violence and promotion and practice of non-violence through education, dialogue and cooperation;
- At the inter-governmental level, it is hoped that there will be full respect for principles of sovereignty, territorial integrity and political independence of States and non-intervention in matters which are essentially within the domestic jurisdiction of any State, in accordance with the Charter of the United Nations and international law;
- Full respect for and promotion of all human rights and fundamental freedoms;
- Commitment to peaceful settlement of conflicts;
- Efforts to meet the developmental and environmental needs of present and future generations;
- Respect for and promotion of the right to development;
- Respect for and promotion of equal rights of and opportunities for women and men;

- Respect for and promotion of the rights of everyone to freedom of expression, opinion and information;
- Adherence to the principles of freedom, justice, democracy, tolerance, solidarity, cooperation, pluralism, cultural diversity, dialogue and understanding at all levels of society and among nations; Peace education is pursued through the revision of the education curricula to promote qualitative values, attitudes and behaviours of a culture of peace, including peaceful conflict-resolution, dialogue, consensus-building and active non-violence.

Other aspects of this activity are the support for cultural and linguistic diversity in education An important set of activities in peace education seeks to promote sustainable economic and social development by reducing economic and social inequalities, by eradicating poverty and by assuring sustainable food security, social justice and environmental sustainability. It is on this set of activities that efforts in peace building through peace education and socio-economic advancement intersect. Hence as was shown earlier peace education can be enhanced through science and technology.

Since conflicts arise from disputes over natural resources (land and water), the sustainable management of natural resources and the environment should be part of the curriculum of peace education. Scientific knowledge including indigenous knowledge is extremely important in environmental management. Hence Science and technology education will contribute to peace education.

Conclusion

The programmes for peace building often include actions for socio-economic advancement, dialogue and peace education among many others. Science and technology have four attributes that can be deployed in these programmes:

- The scientific knowledge;
- The scientific process (method);
- Applicability for service (technology) and
- mindset (logical analysis of problem).

It is concluded that these attributes can be useful in several of the peace-building actions.

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