20. Towards a Theory of Change: A Postscript for Policy-Makers

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Introduction

Do our educational systems continue as they do by design or out of inertia? I would suggest that the answer is a bit of both. Some of the reasons for this are financial. Throughout Africa, despite the fact that a significant percentage of recurrent budgets is spent on education, schooling becomes increasingly inadequate with the rising demand on available funds. One must then ask why we continue to support a style of schooling that is demonstrably failing and that we cannot sustain. Yet education in Africa has seen wave after wave of attempts to reform the curriculum but they have not had the desired impact. Perhaps this is because they have been initiated and implemented either by donor organisations that cannot be expected to fully understand conditions in Africa and whose professional reference point is international, or by politicians whose motives are to ensure that they are re-elected. Neither are adequate motivations.

We must, however, be convinced of the validity of the type of science and technology, and science and technology education, that we wish to promote. Chapters 1 and 2 address these issue directly and all the other chapters do so indirectly. They suggest that from the furthest village to the sophisticated laboratories in the capital, Africa must become a continent of knowledge producers rather than consumers. Chapter 3 suggests criteria that the countries of sub-Saharan Africa could use to develop relevant and productive science and technology and science and technology education programmes. Africa needs scientists and technologists working at the most sophisticated level to solve her economic problems, in the way that Fabiano, Mshigeni and Mwandemele describe in their account of the establishment of a cassava starch industry in Malawi (Chapter 4). Africa needs her best technological minds to work with artisans and village women to transform their practices as described in the account of projects in Ghana (Chapters 5 and 6). We must question why educational systems (formal and non-formal) in the countries of sub-Saharan

Africa continue to promote science as a body of knowledge to be taught using non-existent expensive equipment, that is to be memorised and that cannot be used to solve everyday problems. Chapters 11–17 have argued, with detailed anecdotal evidence, that a problem-orientated science and technology can have a deep impact not only on the lives of learners, but also on those of the local community. Does traditional science teaching lead to village households with energy-conserving stoves, evaporation-driven coolers and a better understanding of household medicine as described in Chapter 13? Chapters 4–6 have eloquently demonstrated that this approach to science and technology can contribute significantly to the formal and non-formal sectors of the economy. Chapters 4 (on informal sector consultancy services), 11 (on museums, press and radio) and 18 (on television) have shown that structures other than schools can effectively promote an inquiry approach to science. Chapters 15 (Ghana) and 16 (South Africa) have shown how policy can initiate and support change and a better public understanding of science and technology. AFCLIST is convinced of the benefits which an appropriate science and technology and science and technology education can bring to our continent. Convinced of this, and based on its experience with more than 100 projects in 15 countries over 12 years, AFCLIST has developed a theory of educational change to enable it and others to participate more effectively in the process.

The Theory

The African Forum for Children's Literacy in Science and Technology is committed to educational transformation and feels it has a responsibility to reflect on its 12 years of experience in order to develop a theory or hypothesis of systemic educational change for consideration by educational policy-makers and activists. To effect sustainable educational change and development, AFCLIST considers the following to be critical:

- Identification and nurture of innovators
- Adding value to innovators and innovation
- Extracting value from innovation and innovators
- Institutionalising innovation
- Providing the catalyst for system-wide change.

Identification and Nurture of Innovators

Africa has enough problems; we see bad teaching at all levels of education and in the informal, as well as the formal, educational system. Perhaps we would be better off looking for the good rather than the bad. Not all teachers will be

as talented as the Malawian primary school teacher or the secondary school teacher who established the village environmental centre in Zanzibar (Chapter 12), but without doubt talent there are talented teachers, from those in Chilambo's environmental education project in Malawi (Chapter 13), to the inventive scientists and technologists that have done so much to energise the informal sector in Ghana (Chapters 5 and 6), to the ingenious authors and publishers in far-off Kagera in Tanzania (Chapter 11). Previous chapters in this book have been a litany of praise to Africa's innovators.

We must not, however, expect to find innovation fully formed. We must learn to recognise innovation even when it is a seed. Every innovator described in previous chapters, indeed every author in this publication, began in the smallest way. We and they have grown and developed because we have been professionally nurtured. Whether we are pre-school teachers, university professors or cabinet ministers, how well do we look for and nurture innovation?

An aspect of professional support that AFCLIST encourages is that provided by grantees' colleagues. Though input provided by us 'experts' may be invaluable, we are lucky if we can visit innovators even once a year yet colleagues are met daily. AFCLIST fosters such co-operation with colleagues whenever possible, funding groups rather than individuals. Some school systems, such as that in Zanzibar, have institutionalised such support by establishing appropriate networks of teachers' centres and encouraging professional associations.

As more than one chapter recounting experiences in Ghana, as well as the case study from Swaziland, reported, professionals in the formal and informal sectors of the economy can, when approached properly, provide substantial professional and financial support to innovators at all levels of the educational system. Such support was outstanding in the starch project described by Fabiano. Yet throughout Africa, in-service teacher developers consistently overlook such nurturers of innovation, either calling on their professionalism too late to provide them with an opportunity to mould projects or asking only for financial support. Such sectors are the future employers of school-leavers, have constructive ideas concerning school learning and are frequently more committed to supporting good schooling than they are given credit for.

Perhaps the most important, and certainly the most permanent, group of stakeholders in the ongoing development of schools is the local community, especially the parent body. Certainly gender projects that AFCLIST has supported in Ghana and Zanzibar have demonstrated that lasting impact is

achieved only when the local school community is involved, unlike the fleeting impact made by 'girls only' projects such as science clinics. Findings by Naidoo in an unpublished PhD thesis confirm that though outstanding principals or teachers can temporarily change a school's culture, it is only when the culture has been institutionalised by the local community that a culture of innovation become long-lasting.

Adding Value to Innovators and Innovation

Nurturing innovation is, of course, adding value. However, since AFCLIST's experience is that the innovators drive change, their impact will be more significant and lasting the more dedicated, skilled and professional they become. AFCLIST uses a variety of approaches to broaden identified innovators' professionalism and to strengthen their dedication.

One of the strategies AFCLIST uses to add value to innovators is to support a variety of networking activities. These include sponsoring individuals engaged in similar work to make working visits to each other. The Science and Technology in Action in Ghana (STAG) project in Ghana (Chapter 15) and the Linking School Science with Local Industry and Technology (LISSIT) project in Swaziland (Chapter 14) both grew as a result of such visits. Work in mainland Tanzania, Eritrea and in selected island states in the Indian Ocean has similarly been stimulated. Constant encounters with like-minded colleagues from other countries at meetings sponsored by AFCLIST to add value to innovators have further strengthened innovation. AFCLIST has added to the competencies of many of the educators responsible for the projects described above through convening special skills workshops in areas such as print materials production, proposal writing and action-research methodologies that are always task-orientated. AFCLIST considers that the high quality of publications such as those produced by STAG, LISSIT and others described above fully justifies their investment.

Extracting Value from Innovators and Innovation

One invests to receive a return in the future and one must anticipate how to use one's return. AFCLIST deliberately plans how to extract and apply the investment it makes in innovators and innovation and does so even before it makes a grant.

Though AFCLIST's policy when making grants is reactive rather than proactive, it hopes that the work it supports will, at some time in the future, affect national educational systems. By encouraging proposals from teams that

represent key institutions, such as curriculum centres, advisory services and examinations councils, AFCLIST's intention is to foster feelings of ownership and increase the likelihood of projects having a national influence. Thus AFCLIST attempts to anticipate the day when it will extract value from its original support for innovation as projects go national. AFCLIST has found that it is critical that all stakeholders are involved in change as early as possible. STAG in Ghana and LISSIT in Swaziland provide examples of such stakeholder involvement.

AFCLIST must also, however, extract value from projects it supports in ways that benefit the African continent and not only their country of origin. Ways that AFCLIST has used to extract value from its investment in innovation include:

- Sponsoring project team members to give presentations at key regional and international meetings such as GASAT9 and IOSTE9 during 1999. Cross-country professional connections made at such meetings frequently lead to follow-up work such as the project involving the Malawian primary school teacher described in Chapter 12 and educators from Cameroon, Nigeria and Togo that grew from professional links made at GASAT9.
- Strongly encouraging and technically supporting grantees to publish so that others can become familiar with their work. A spin-off benefit of this policy is that writing motivates grantees to become more reflective and analytical about their work. AFCLIST's support has led to many forms of communication by projects from single-page broadsheets targeted at teachers, to sophisticated web sites, to scholarly articles in journals, to seminal books such as ASTE95 and manuals such as that on proposal writing.

Institutionalising Innovation

Although educational systems in the countries of sub-Saharan Africa are almost constantly in a state of change, usually the repeated changes are in response to political or donor insistence. Reform is usually hurried and is a response to some perceived crisis; more often than not a fresh curriculum team ushers in the new curriculum. Regardless of any qualities, good or bad, of previous curricula, the most recent team of educational experts must initiate a 'new fix'. A culture of crisis, rather than innovation, has become the norm in educational circles in Africa. Ministry of Education officials, as one donor pointed out, are usually too busy maintaining the status quo to engage in innovation, which they leave to the donors. Furthermore, curriculum development and change in Africa rests with Ministry of Education bodies

who usually have little contact with universities, which are the institutions charged with the responsibility for exploring the frontiers of new knowledge and for transmitting this knowledge and the techniques of knowledge production to subsequent generations. As a result, too often in Africa educational innovation literally means starting all over again. Rarely is there even an institutional memory of earlier reforms, or a knowledge of what has been tried in countries with similar circumstances. Instead, more often than not a team of high-powered educationalists will visit and advise approaches used in, for example, Canada or Australia. In the absence of an established culture of educational innovation, the countries of sub-Saharan Africa will forever continue to be dependent on such foreign expertise.

Professor Jophus Anamuah-Mensah is the Principal of Winneba College of Education and Director of SACOST. As described in Chapter 15, SACOST was deliberately established in 2000, with help from AFCLIST, to institutionalise a culture of educational innovation with specific reference to linking school science and technology with that of the community and workplace. As Professor Anamuah-Mensah describes, SACOST has already established vibrant formal and professional relationships with appropriate institutions in the Ministry of Education and the Ministry of Science and Technology, many major industries, other universities and professional teachers' associations, as well as key parastatal institutions such as Ghana Regional Appropriate Technology Industrial Science (GRATIS) and the National Board for Small Scale Industries. SACOST sponsors undergraduate, graduate, PhD and postgraduate research, involving scholars at other universities as well as practising teachers. Often this work is supported by local industries which, for example, sponsored a Winneba researcher to attend a major international meeting held in Hawaii in the summer of 2001 on indigenous science. SACOST has been selected by the Ministries of Education and of Science and Technology to be the secretariat of a major government commission on science and technology education. In short, in a brief length of time, SACOST has become a national and international focal point for linking school science with that in the community and workplace.

We have described SACOST in some detail. With similar assistance from AFCLIST, a sister centre to SACOST has been established at the University of Swaziland, as well as centres at the University College of Science and Technology Education in Zimbabwe and Venda University in South Africa, that address issues of teaching science in large, under-resourced classrooms. Centres in Malawi and Zanzibar address issues of environmental education in much the same way.

AFCLIST intends to help create other centres of excellence in different countries of sub-Saharan Africa and has taken steps to do so in the critical fields of examinations and teacher education. Without such institutions, as far as science and technology education is concerned, Africa can never have a past; without a past it is difficult to envisage a future.

Providing the Catalyst for System-wide Change

Rarely do the stakeholders in education have an opportunity to meet in a relaxed atmosphere to discuss schooling. During 2000 and 2001, AFCLIST facilitated such gatherings in Zanzibar, Ghana and Malawi. Each meeting followed a similar pattern. Grassroots representatives attended the first day of the meetings, namely representatives of students, teachers, parents, small-scale business people, and religious and political leaders. Short presentations of the science and technology projects in their respective countries were followed by discussion. Then participants observed a class of primary school children being taught by an experienced teacher – in Zanzibar this became known as the 'bang' lesson. The general response can be summed up by a remark made by a local sheikh when he exclaimed that nobody in their right mind would ask someone to prepare a body for burial who had learned how to do so only from books. He added that he did not understand the minds of the Ministry of Education. After discussion in the 'bang' lesson, participants broke into groups; parents met together, teachers met together and so on, and they were given the task of discussing what each group would do on their return home, using their own resources, to promote that style of science teaching. At all meetings these groups worked late into the night.

On the following day participants were representatives of college-based and school-based teacher development institutions with the most articulate of the representatives from the first day remaining behind. The pattern for the second day was similar to that of the first day except that the teacher educators listened to the action plans of the grassroots representatives.

On the third day, senior Ministry of Education officials were represented, such as staff from the advisory service, curriculum centre and examination council, and they too listened to action plans, observed a 'bang' lesson and in turn developed their own action plans. By this stage of the meetings, in the relaxed atmosphere provided by the meeting facilitators, everybody had the confidence to express themselves openly. Indeed, the primary school students participated in all meeting sessions, presenting their views with confidence and determination.

There was no 'bang' lesson on the fourth and closing day. Instead, participants spent the half day listening to the action plans of all the groups from the previous three days and the first group to present their plan were the children, who held participants fascinated. On the fourth day the participants were ministers, principal secretaries and directors from relevant ministries such as education, science and technology, and foreign affairs; representatives of the formal sector and the donor community; and representatives of the media. Deliberately, no requests were made of these groups other than that they participate in discussion and respond to what they heard reported. In all three countries the unsolicited responses were almost frighteningly enthusiastic, and in all three countries follow-up by all parties is showing signs that an integrated approach to change in the popularisation of science and technology is now underway.

Summary

We have described AFCLIST's theory of systemic educational change in some detail. We have done so in the hope that some of it may resonate with the thinking of some policy-makers and activists. Our message is simple and optimistic. Provided they are given an appropriate environment, African children are capable of amazing creativity and focused work. And, most important, the appropriate environment can be provided using our own human, cultural, physical and economic resource base. What educational systems in Africa perhaps need most of all is vision, determination and an absence of expecting miracles by decree.