



ASESP

**EDUCATIONAL
RESEARCH
FOR DEVELOPMENT
IN AFRICA**

**BREDA
UNESCO Regional
Office in Dakar**

**African Social
and Environmental
Studies Programme**

PREFACE

EDUCATIONAL RESEARCH FOR DEVELOPMENT IN AFRICA

The present publication is the result of two years of fruitful cooperation between UNESCO Regional Office in Dakar (BREDA) and the African Social and Environmental Studies Programme (ASESP), based in Nairobi (Kenya). First published in the form of a simple conference proceedings, it has now been revised, and new papers have been added from various countries, and the entire work is being published for use by a wider audience.

As the title indicates the publication deals with educational research, but with particular emphasis on the use of research results in policy formulation and the practice and development of Education in Africa. Thus, the papers in the first section set the scene by attempting to elucidate general issues related to educational research in Africa: an assessment of research efforts in the region, impediments to the conduct of research problems of dissemination, etc.

The second section deals with country experiences and more particularly on the assessment of the impact of education research efforts on policy, on addressing specific problem areas of national education, on innovation, and on the practice of promoting teaching and learning. It is expected that papers in this section would serve the purpose of illustrating how specific problems were tackled in the countries covered and can thus help in designing policy-oriented educational research in other countries in the Africa region.

Edited by:

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and

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In the third section are papers which offer suggestions on ways of generating and disseminating knowledge on Education in the African context. These papers, like the rest of the volume, are not intended as prescriptions. They should be seen instead as material needed to generate further reflection on appropriate ways of bridging the communication gap between researchers, policy makers, and practitioners.

The views expressed by the authors are not necessarily those of UNESCO and do not commit the Organization to any policy or position on educational research or on development.

Some of them have since moved policy-making positions. Co-edited by the UNESCO Regional Office in Dakar (BREDA) and the African Social and Environmental Studies Programme (ASESP), the Q. Box 44 777, Nairobi, Kenya. We hope that the publication will be useful to policy makers and practitioners.

The work of the publication was supported by the African Social and Environmental Studies Programme (ASESP) and the UNESCO Regional Office in Dakar (BREDA). The work was carried out by Clifford Fyle, who organized the seminar on the subject and Peter Muyanda-Mutebi, who made all the practical arrangements for the seminar and who

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CHAPTER 9

Policy Research and Educational Innovation Computers and Education: The Senegalese Case

by

*Hamidou N. Sall**

"Utopia seems now more within our grasp than had formerly been thought possible"

Nicholas Berfaieff

Since the establishment in 1982 of the Computer and Education Center (CEC) in the Faculty of Education of Dakar University, research in the CEC has been deliberately oriented towards policy research as distinct from what is called discipline or fundamental research. The work of the CEC is guided by Government through a tacit commitment linking both the National Computer Division in the Office of the President and the University of Dakar with the Centre. Through these partnerships the Centre acts in an advisory role vis-avis the Ministry of Education, assisting in the decision-making process in educational innovation and in the introduction of computers into the educational system itself.

The Centre has acquired long and considerable experience in its chosen research field, and it made an important contribution to the policy decision of October, 1988 to launch a large-scale pilot scheme introducing computers into schools. In my opinion, this exercise marked the beginning of a more coherent phase of educational policy.

In the CEC, research has included both action and participatory research modes as defined by the International Council for Adult Education (cf Status Report on the Participatory Research Project, Toronto, Canada 1977 reported in Landsheere (1982:17). The composition of the Centre personnel, which includes both education researchers and teachers of different levels, results in an audit type or monitoring structure in the Centre.

The application of research results by teachers and by the community at large, and the monitoring of the Centre by a National Monitoring Committee (an inter-ministerial committee) determine the type of research undertaken by the Centre, that is policy and participatory research, rather than pure or fundamental or discipline research. The public wants to know whether schools are indeed responding to the needs of scientific and technological development, whether socio-

* Translated from French by Anna Obura.

economic and cultural development will depend or not on the introduction of new technologies into the school system and whether the essence of modern day knowledge can be transmitted without necessarily using computers. Policy research must take as its model the example of science and technology.

Education and Technology

Significant scientific and technological development transforms ideas, work patterns and production modes, and these important modifications are the result of technological mutation. Indeed the systematic study of techniques, that is technology, by requiring the identification of different uses and different production processes, has forced teachers and engineers to introduce scientific methods into the analysis of an area which until recently had remained the domain of empiricism, and has made it mandatory to design new processes derived from discoveries in the field of the sciences (Twentieth Century Larousse Vol. VI p.617). As a result of this systematic approach, which is common to all areas of study today, culture and society are now distinguished with the seal of scientific and technical examination.

Education and teaching, which tend to use increasingly sophisticated technology can and must use more of a technological approach to problem solving. It is not through heavy investment in education, or by flooding schools with technical devices that educational systems will improve. Traditional education has no real pedagogical function, nor does it involve appropriate follow-up activities. And this is partly due to an almost total refusal to use audio-visual materials. Schools are equipped in most cases in a haphazard and blind manner, as far as technical teaching aids are concerned. Only the most informed among the teachers manage to take advantage of the technologies available.

Despite all this, year by year, in thousands of classrooms around the world, the use of technologies involving recording and playback of audio and visual materials, and electronic information processing, are increasing. This use of 'machines in schools' is defined as education technology. However, schools do not always make rational or appropriate use of these machines since they are often considered as mere 'gadgets' which, as a result of commercial interests, are flooding into schools. Hence these modern playthings, these machines, constitute an attractive alternative to the otherwise dull setting of the classroom.

However, schools also present specific problems in this domain which prevent them from being passive consumers of industrial products. Industry will in the future have to design more appropriate teaching aids for educational institutions. At the same time methodological innovation is necessary for ensuring the best use of technology for educational purposes. It is a central goal of educational technology to improve the efficiency of the teaching enterprise.

Educational technology can be defined as "a complex and integrated process involving human resources, processes, ideas, means and organization, for the purpose of analyzing problems and for

designing, experimenting with, evaluating and generating solutions to problems in learning situations." This definition of the Association for Educational and Communication Technology (AECT), together with that of Lachance and his team, suggests the boundaries of the field of educational technology, which include human resources and techniques, methods and management, organization, communication and content, etc.

These subtle distinctions defining the relationship between education and technology suggest that it is simply not enough to provide schools with technical equipment which is often thrust into cupboards at the back of the classroom or is sold off second hand. Nor should local and therefore temporary solutions be mechanically applied to clearly identified educational problems. Nor can it be right to similarly introduce scientific inventions and their applications into schools in the name of innovation. Materials and equipment are undoubtedly necessary for efficient teaching, but are not sufficient in themselves.

Modern schooling practices and truly scientific education are joyful activities through which learners develop their full and unique personalities. They present multiple challenges which are not fully understood by all the actors in education. The goal is to prepare young people for all participation in contemporary life, to reduce low achievement and failure, to eliminate technological disparities between urban and rural areas, between rich and poor nations, to foster economic and social development, among other things.

Senegal, like many other developing countries, faces many of the above complex and multifaceted educational problems, in particular, chronic inflation (6.5%) following on economic recession, high social demand for education (enrolment of 55%, 13% and 2%, respectively, at primary, secondary and tertiary levels) and unemployment. His Excellency President Diouf declared on Labour Day, May 1, 1988 that "one of the top priorities of the Government is to solve the unemployment problem for young professionals such as doctors who are nevertheless needed in some of the urban areas and in the remote rural areas; and other professionals".

The educational crisis has been present in Senegal well before the 1980s. Thus the Education Reform of January, 1981 produced by the Board of Education and Training was an ambitious plan covering the total educational system. It responded to deeply felt needs expressed by the people, and established a democratic national system based on the wishes of the people, identifying optimal conditions for implementing the 1971 Education Act. The Act had specified the need for upgrading the educational levels of the total population; the training of men and women for creating optimal learning conditions at every level, for contributing to the development of science and technology, for finding solutions to the problems of national development. As a developing country, Senegal worked towards possessing and mastering science and technology. It is only through setting up a new and sound educational system that Senegal will succeed, by "planning for a process of overall development in which the whole nation will participate". The objectives of education

will be "to guarantee a progressive course for the development of the nation in its entirety" (Education Act No. 71-86 3.6.1971, J.O.R.S. No. 4169 pp.590-1).

However, the difficulties of the last few decades leave little leeway for governments. Meanwhile their role is to adopt and establish educational and training policies relevant to the economic context, including considerations of production. The problem is how to reconcile these contradictory demands. The Education Reform that Senegal embarked on in the 1980s is a wide ranging innovative programme stretching from pre-primary to tertiary levels. In order to realize these ambitious plans for education there must be an appreciation of the fact that "innovation can only take place within the context of current trends in education", and that "the mechanisms of change cannot in themselves bring about innovation". Innovation must take account of the new technologies.

Thus the planned systematic and gradual introduction of computers into the Senegalese educational system will take the above factors into consideration. The desirability of this alternative, among others, will be carefully examined.

Education and Computers

Current developments in science and technology bring us closer to a world dominated by information technology. The entire spectrum of industry, with its intellectual and material resources, are oriented towards the information sciences, an inexhaustible resource in itself. The disparity between nations is now increasingly marked by their ability to decode and manage information. It is therefore important to develop information and communication skills right from the level of the school. Learning to learn, developing communication skills, creative and affective skills, all these noble educational objectives whether implicit or explicit will only be achieved through learning to communicate. Pupils must therefore learn to communicate better, to collect, process, report data and so on.

From time immemorial, in all teaching contexts, the teacher has used communication as his main teaching tool. Today, the same teacher will not succeed in this task if he gratuitously neglects the modern tools of communication, of electronic information processing. These information tools can become teaching aids, possibly better aids than before, and they may possibly teach more. With these inevitable and necessary changes, "the teacher will also have to modify his teaching strategies ... and even the role of teaching must undergo transformation. The teacher will no longer be the sole repository of information for pupils, the sole master of the ship. From now on he will have to take his crew into account, he must use alternative sources of information for the class... He must become a manager in the classroom".

Pupils will also find new roles to play and will face daily problems in the classroom. Street learning for some of the pupils will now be added to increased informal learning experiences. Pupils enter school these

days with more knowledge and know-how than ever before. The role of the teacher is to be a facilitator, a resource person, an advisor, a guide, a stimulus for structuring learning, to assist in managing the information pupils have gathered, to lead pupils to question the information gathered, etc. We have noted the importance of the pupils' learning to learn, learning to express themselves, learning to communicate, but they must also learn to develop critical awareness, and deductive and inductive ability. Well planned use of modern communication tools and information processing tools can assist in such learning.

However, a miraculous innovative transformation of schooling will not come about with a disparate mix of programmed and algorithmic learning modules. The use of information technology in education will necessarily mean careful preliminary research into selecting the best teaching strategies, the most relevant methods and better defined educational objectives, devising a more coherent overall plan. With computers in the classroom, the adage "a small dose will get you nowhere" is more relevant than ever! There must be a reasonable level of intensity, a fairly radical transformation, for any new technique or methods to bear fruit in a classroom setting. We talk in terms of 'a critical mass' and the relevant 'critical' level of change must be reached if we are not to waste time on half-measures.

In attempting to utilize new communication and information technologies for reforming education in Senegalese schools, more efforts will have to be made in the future in view of the fact that the current educational system is largely irrelevant to the needs of the country. This situation is due in part to the colonial heritage of the country in terms of the content of the curriculum and of teaching and learning practices. Schools must respond to changing times. Deterioration in the quality of teaching has been noted over the last few years. Training and studying abroad is difficult and arduous even for the best of Senegalese students. And, what is more important, in Senegal itself, teaching methodologies and curriculum content are outdated. There is a unanimous and deeply felt cry for reform of education methods and curriculum, as well as a need for innovative educational media.

For both the young and adults, access to information sciences will be an interim phase. They will present a new and historical opportunity for learning, new techniques to be mastered, new tools for learning at the service of the people and the nation. This is the objective of the new system of education in Senegal. Technological evolution is necessarily implied in the new educational reforms, introducing current technology into schools. This must be done carefully, with moderation, and in a systematic manner. Wild experimentation must be avoided. Therefore, several pilot projects will be set up and evaluated; below we comment on one such projects.

The Computer Project

Initially the CEC's activities were concentrated on working on LOGO. The Centre was established in 1982 and set out to train young

Senegalese in information sciences. These first experiences were most successful and pointed to increased introduction of computers into Africa. When introduced to the programme TORTOISE LOGO children of 9 to 13 showed sustained interest throughout their computer lessons. They worked in groups of two or as a class group rather than individually, and produced the most complex results that could be compared with any comparable population of children. The success of this experiment was entirely due to careful lesson planning and to the precise definition of the objectives of each computer lesson.

This project led to the conclusion that in computer assisted learning, more than in other types of lesson, instruction must be well planned and structured, each algorithmic step requiring detailed analysis, each result needing a check with stated objectives, each lesson requiring post evaluation and possible integration with a later and more complex learning activity. Pupil-pupil and teacher-pupil interaction and collaboration received positive reinforcement during computer lessons and the active participation of the usually passive pupils increased considerably. Teachers have noted growing positive attitudes towards learning across the curriculum emanating from the experience of computer assisted learning.

What must be recognized however, is the fact that computer learning requires more active participation of teachers in schools. This participation helps serve as a model for pupils to emulate. Training in new teaching methodology will therefore be necessary and should include theoretical and practical training methods in computer assisted classroom situations. Such an approach will forestall the resurfacing of the 'gadget' syndrome which could bring with it indifference and negative attitudes from pupils as well as rejection of computer learning on the part of teachers and pupils.

The expansion of CEC activities in the domain of computer assisted learning, in programming, in all levels of education, must examine carefully the training requirements for teachers. Methods and computer training of teachers is an essential precondition for the successful introduction of computers into an educational system. This training cannot be improvised or haphazard in any way, and cannot be exclusively composed of computer programming training. A smattering of computer training could be more dangerous than the attempt to introduce ETV or education by radio, for example.

The current developments in the world of information sciences is urging schools to open up. Public opinion is also demanding that educational systems open up to information sciences. The private sector has already introduced computers into schools. The simultaneous progress of information sciences and of the attempt to make schools relevant to society means that we shall have to wait for conclusive results to current research in this area. Expecting research to determine once and for all the best and the only norms for education is equivalent to stating that there is only one good and right objective of education, and that once this objective is defined all teachers and pupils will adopt it. But

the most fundamental educational innovations have always originated from the most rare and distinguished thinkers and educationists.

Research is a necessity, given the 'most rigorous ever requirements... and the danger of the return of charlatans and various manipulations of the system'. The very rapidity of information accumulation and the mass of new computer applications would indicate the need for moderation in this field. Economic and financial constraints also point to the necessity of careful resources management.

As a result of economic recession and scarce financial resources, the introduction of computers into schools will need considerable efforts, and the exercise will not be successful unless it is done in optimal conditions and extensively, rather than in laboratory conditions. This will require the selection of pilot schools and tests for various subjects across the curriculum adapted to the needs of schools. The debate on whether the project should start in the primary, secondary or tertiary level is like the debate on squaring the circle.

For optimal EAO computer assisted learning (while research is continuing on EIAO systems), evaluation and later the design of education software for subject tests will lead to an improved national examination system.

Teaching with computers from the primary school up will enable children to familiarize themselves with the world of information sciences. The use of automated programmes and of initiation programmes together with LOGO systems will be reinforced by learning in information sciences. At intermediate school and in high school, programmed calculators and microcomputer programmes will complete the adolescent's computer training. With this education 'package', school leavers will be trained for any job in information systems.

Given the current system of education, computer application to general education will differ from applications to technical and vocation fields. The gap between literary and scientific streams should narrow. Final school examinations should be optional at first, then compulsory for all pupils in all subject combinations. The university will be able to select computer trained students ready to take up tertiary studies in academic and training institutions, in the fields of classical academic study and in research based on computer assisted methods.

Educational systems in both developing and developed nations should adapt to contemporary knowledge and know-how and must incorporate the new technologies of information sciences and communication sciences. The problem of adapting the educational system at all levels and across the curriculum will become a problem of survival, for in ten to twenty years from now the danger is that the world will be divided into those countries which have solved the problem and those which have not. Those latter countries will be beset with the danger of sliding imperceptibly down the slope into underdevelopment.