Kolyang

Hurdles and requirements of an African experience of e-learning

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Djamshid Tavangarian,
Kristin Nölting (Hrsg.)

Auf zu neuen Ufern!

E-Learning heute und morgen

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Kolyang

Hurdles and Requirements of an African Experience of E-Learning

Abstract

Today, in a tense context of globalisation of economics and finance, education and training must obey global requirements. Computer science and new learning environments have become crucial in developing countries. Information and Communication technologies (ICT) are present in telecommunications, the banking sector, health and education itself. This article underlines the role of e- and distance learning in education, research and societies. Frontiers are shown and ways for best practices are presented. Furthermore, it underlines the challenge of teaching computer science in a poor industrial environment. Technological background is discussed as well as financial and pedagogical aspects.

1 Learning as a Challenge

Education is facing a lot of challenges in the actual globalisation process. In a seminal book L'éducation en Afrique, published in 1961 and re-edited in 1996, the late Abdou Moumouni (Moumouni, 1961) was predicting the difficulties and proposing an adjustment of the formal education system to African realities. The different challenges of higher education in Africa cover lack of motivation, absence of adequate training infrastructures, increasing student population, lack of a policy etc.

But the problems are deeper. They start already at the roots as mentioned by Henry Tourneux and Olivier Iyébi-Mandjeck in their book *L'Ecole dans une petite ville africaine (Maroua, Cameroun)* (Tourneux & Iyébi-Mandjeck, 1991). The modern formal education as existing today has not adapted itself to the context of African realities. Both authors studied different primary government schools in Maroua, a town located in the northern part of Cameroon. Their results showed that the modern education system is not compatible to the education system as found in traditional groups of the region.

Local case studies carried out by Kolyang Dadaï and Kolyang Dina Taïwé in *Na jon Hrage / Les jeux Tpuri* show that there is a strong need for a new educational

system in African contexts accustomed to training systems like learning from games from the little childhood on (Kolyang & Kolyang, 1991). Also, the French sociologist Pierre Erny, in his book *L'Enfance en Afrique Noire*, studies educational mechanisms, which can stimulate the new orientation that African education needs for its improvement or even to go new ways (Erny, 1987).

African universities have the challenging task of working in difficult contexts according to their vocation of training and research, if we accept the generalized goal of a university as a threefold mission: 1) to provide quality teaching and learning economically, 2) to undertake research and 3) to provide consultancy and outreach services.

Since the beginning of the 1990s, efforts have been done. In 1995 the World Bank initiated the African Virtual University, a satellite based distance education project whose objectives are to deliver to countries in Sub-Saharan Africa, university education in the discipline of science and engineering. In June 1999, the African Virtual University was implemented and tested in 22 universities in 16 countries (Afermann, 2000) linking universities as far as Ghana, Uganda, South Africa etc. The African University in Alexandria (Egypt), the Virtual Library Project based in South Africa, the good efforts made by the African Universities Association, courses put on the Internet, the first African Satellite RASCOM, constitute some contributions to bring the continent out of difficulties facing its connection and participation to the global village.

Nevertheless, the gap between have and have-not, those who have access to information and those without access is getting wider and wider, and this even more within higher education institutions themselves.

2   Challenges in Changing Learning Environments

In industrialized countries, life has changed dramatically in the past decades. Besides telephones, television and electronic media, one uses the computer together with the Internet to order goods, consult train tables, or access more and more the online educational content of numerous universities and other knowledge providers.

E-learning – a form of learning that uses the electronic means is becoming a common feature for modern-day life. Computer simulations make it easier to understand complex subject matters. These systems encompass some of the following categories:

- Programs for vocabulary training, machine-based training, arithmetic training etc.
- Intelligent and adaptable tutorial systems

- Hypertext and hypermedia linking different documents to multimedia
- Tele cooperative learning scenarios which permit social interaction and seem more up-to-date with contemporary society.

All these systems can be connected as least temporarily at a data transmission system to allow distance learning. More than these virtual experiments and laboratories, virtual lectures, simulation and animation software and interactive experiments and design are available. Internet based videoconferences allow to collaborate with others and coaching by e-mail or telephone is possible.

Virtual instruction offers numerous advantages. Web based material can speed up the exchange of information between participants and multimedia learning units. They are an effective method of imparting knowledge and optimising cognitive processes (simulation, visualization, animation). Time and space for resources can be saved. Students can tailor their learning areas to their particular needs. Universities have to provide less lecture venues and student residences. Companies can book training courses online. Socially marginalized groups such as prisoners and the handicapped can access to education equally.

2.1 Experience at Universities and High Schools

African universities in general and Cameroonian universities in particular are facing challenges stemming on one hand from the structural adjustment programs imposed in the nineties and on the other from the infrastructure dilemmas which are twofold.

Dilemma on staff of Lecturers: There is a big problem among the staff for lectures at African universities. Many of the lecturers are themselves e-illiterate. This cause a big problem of knowledge transmission, when it comes at the central point of using e-learning methods to transfer knowledge to students. Sometimes students have better skills than the lecturer themselves.

Old versus New Pedagogies: This causes a pedagogical rupture and the traditional way of paternalising knowledge is broken. The university becomes a place of dispute besides each aspect of controversial discussions on science and future dreaming. We did a small experiment with colleagues at the Department of Mathematics and Computer Science at the University of Ngaoundere, Cameroon. It consists of using e-materials in teaching. Students who have no access to libraries find themselves lost during and after the lectures. They had no way of relating keywords and keynotes used in e-materials to literature contexts or textbooks. Accustomed to their old way of learning (dictating the course in full sentences, followed by examples), they had to make a big step towards accepting the lectures presented that way.

At the beginning we had the feeling of an overwhelming pleasure from 17 year old students. It seems more or less as a game, where the seriousness of learning concepts was not present. Though the introduction of Computer Science as mandatory in school curricula seems to give a chance to get familiarized with new methods, scepticism is necessary. In fact, the lack of competent teachers in school makes this experience a failure.

In Ngaoundere, there are ten High Schools with a population of around 5000 students. Only two of them have access to computer facilities. Our experience at some High School Campusses was a total failure.

Experimental Distance Learning: At the University of Ngaoundere we launch a programme for distance learning which encompasses an access to a local database with courses on nutrition and aliments. The experiment is going on. One of the evaluation goal is to study how, in a context of poor industrialization and access to technology, students consume e-learning and what difficulties occur.

From these experiences, we are facing a new challenge of presenting e-learning in a way that relates the materials to old experience of face to face teaching. For instance, the keywords can be linked to explanation where, by clicking, one gets full text or picture explaining in details the notion behind the keyword. This needs an ontology of the domain of teaching, where super classes are related to their and subclasses. The MMiSS[1] approach could be very interesting here, but it should go further by including structures behind the nodes. Different level can be explored: a shallow structure where only keywords are present and can be seen. The second level can be a level of ontologies where keywords are linked to their classes. Their aspect would be to integrate full text, pictures, voices, etc. within the whole document. This needs repositories, databases, integration of different formats and styles etc.

Main goals
- ♦ **In University Context <u>Learning to Learn</u>**
- ♦ **Finding algorithms**
- ♦ **Transforming Algorithms to Programs**
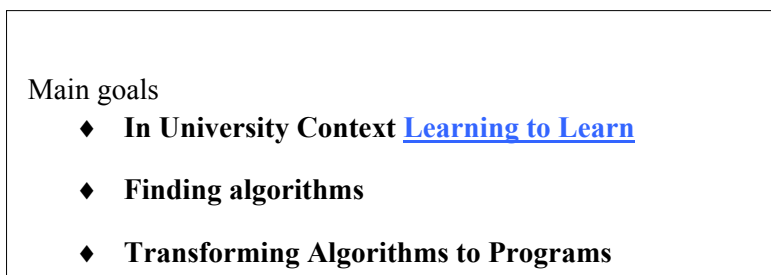
Figure 2.1: Keynotes as presented on an e-medium for a course

Here we have highlighted the expression learning to learn. This means that there are some information related to it. In fact, in a course where stand alone learn

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1   http://www.mmiss.de

processes are required, one should get the capability of waking curiosity by visual effects.

Furthermore the expression *learning to learn* can be linked to an ontology.

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                    ┌──────────────────┐
                    │ Machine learning │
                    └──────────────────┘
        ┌──────────────┬─────┴─────┬──────────────┐
┌──────────────┐ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐
│ Unsupervised │ │  Supervised  │ │Reinforcement │ │  Learning    │
│  learning    │ │  learning    │ │  learning    │ │  to learn    │
└──────────────┘ └──────────────┘ └──────────────┘ └──────────────┘
```
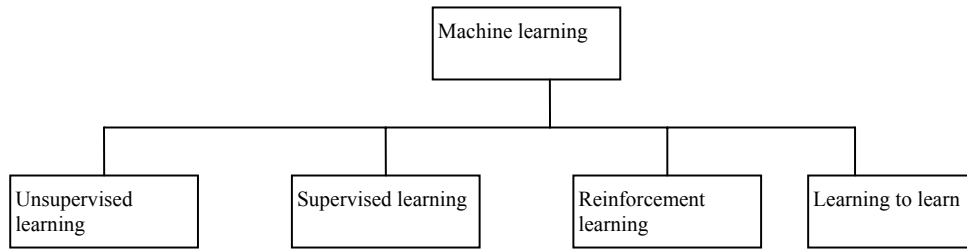
Figure 2.2: Ontology on one layer

But one can need more, for instance a higher level of relationship.

```
                          ┌──────────┐
                          │ Learning │
                          └──────────┘
        ┌──────────────┬───────┴────────┬───────────────────┐
┌──────────────┐ ┌──────────────┐ ┌────────────────────┐ ┌──────────────┐
│Organizational│ │   Machine    │ │   Observational    │ │    Motor     │
│  learning    │ │   learning   │ │     learning       │ │   learning   │
└──────────────┘ └──────────────┘ └────────────────────┘ └──────────────┘
        ┌──────────────┬─────┴─────┬──────────────┐
┌──────────────┐ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐
│ Unsupervised │ │  Supervised  │ │Reinforcement │ │  Learning    │
│  learning    │ │  learning    │ │  learning    │ │  to learn    │
└──────────────┘ └──────────────┘ └──────────────┘ └──────────────┘
```
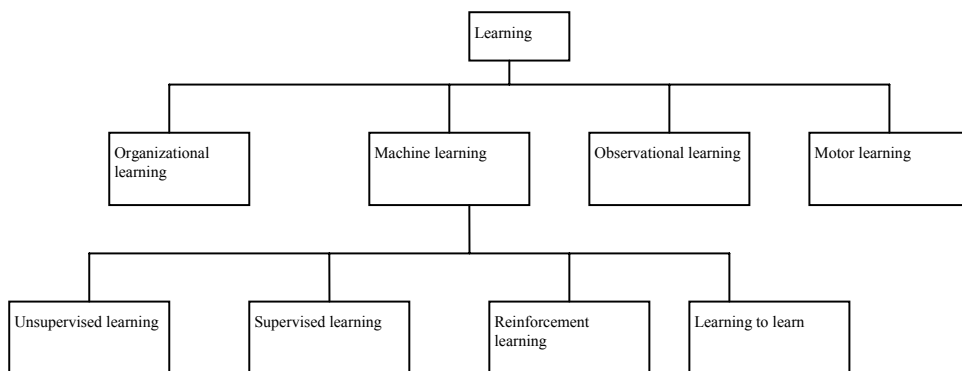
Figure 2.3: Ontology of learning in full context

One may now need to open the node machine learning. This should be possible and should lead to the following bubble text.

Machine learning is a domain of artificial intelligence concerned with development techniques to allow computers to "learn"

Figure 2.4: Explanation linked to an ontology node

2.2   Societies Facing ICT-Changes

One of the biggest challenges we are facing today in Africa is probably the coexistence of technological islands besides traditional middle-aged institutions that re-

fuse to clear places for new methods and thinking. New VSAT infrastructures live besides nomads tents made from tree branches, which seem so virtual because they are so mobile that they never spend more than two months at the same place.

Our own experience focuses on usage of computer and learning through electronic means. We carried out a small study with the telecentres in Ngaoundere. These can be divided into different groups : 1) the mini-enterprises with one or two computers which do not follow any aim of learning. They concentrated their work on earning money from typesetting texts, photocopying and binding books; 2) the second group consists of those enterprises who have more than two but less than ten machines. Besides typesetting texts, they offer training, learning environments and maintenance. The third and last group of telecentres consists of those connected to the Internet and have more than 10 machines and access to the Internet.

In 2000 we carry out a study in Yaounde about the use of the Internet and we found out, that 70% of users of the Internet were women (not older than 30 years) and among them more that 70% use the net to contract a marriage in Europe or Northern America. (Kolyang, 2000)

2.3   Frontiers of E- and Distance Learning

Furthermore the gap between those who have and those who have no access to the Internet or to Information in general is rapidly growing. A class of have-access is built up upon those who are under-informed or have-no-access. If the surfing hour costs 650 F CFA in Ngaoundere (Cameroon), that means one Euro, one must say that this builds for most of the Cameroonians the poverty threshold. Connection costs are also far too high.

E-Learning tools and Environments should be seen as an additional tool that can help researchers and trainers in Africa to make up with worldwide requirements on research and training. Besides these problems, the greatest constraints against the effective appl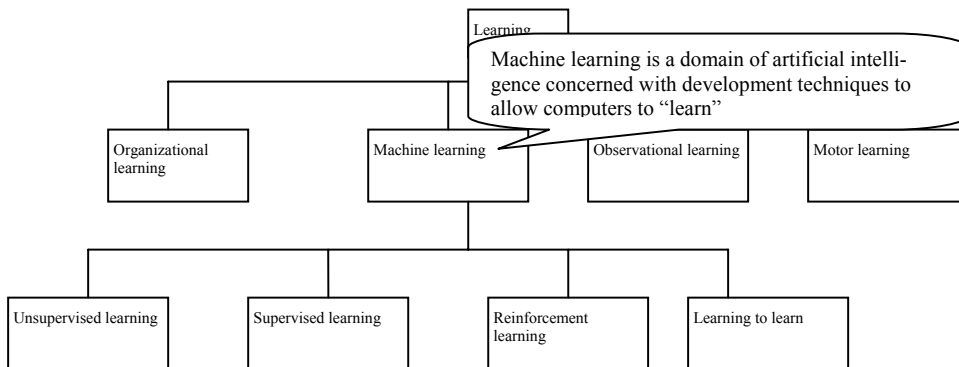ication of e-learning in education in Africa can be classified in two categories: those beyond the university control, and those within the university control.

The constraints of the first group are generally poor telecommunication network (off-campus). In some countries one counts 1 telephone for more that 100 000 persons, and technology and telecommunication monopolies in Africa (high costs, (licensing) regulations), both private and public.

The problems of the second class are polymorph and range from subjective opinions to facts that influence the acceptance of Information and Communication Technologies in the University research and teaching context. Besides the fear of

using new technology in general, there is a lack of appreciation by top managers in the universities who are not very motivated in the development of the universities, which need more than a revolutionary act and an iron will in opening themselves to Information and Communication Technologies. Generally only few research and higher education institutions have guidelines to implement Information and Communication Technologies in teaching.

There is a lack of Information and Communication Technologies appreciation by teaching staff who fears a threat of losing local relevance through mass and standardized learning materials. This fear can be explained by the lack of requisite skills (to apply and use Information and Communication Technologies) and the reluctance to change teaching methods. But access spare parts and maintenance in general of quality electronic equipment build a challenge to universities.

Minor problems like the language, quality judgment of the information content, lack of information on edited, quality proved information as regarding sites are still to be solved individually by each institution.

Furthermore there are certain disadvantages inherent to e-learning. Producing hypermedia documents is a very time-consuming process. Universities do not have the technical infrastructure required.

Other disadvantages are based on the lack of integrated hypermedia tools for conceiving learning material. Existing tools are generally all standalone. Material created for learning do not meet didactic and specific standard leading to the fact that students can easily get "lost" in hypermedia learning sessions. In Cameroon there is no comprehensive countrywide didactic approach towards self-learning. There is a lack of required skills and of consensus on how to visualize learning material. Students and teachers must be experienced in using PCs, which is, in the actual Cameroonian context, not always given. Speed remains a serious problem.

Pedagogical problems are numerous and must be considered seriously: lack of personal contact between students and teachers, problem of self-discipline, new learning methods, influence of previous learning experience.

3 Requirements for a new Pedagogy for E- and Distance Learning

Learning has been definitely shifted from pen and paper to Information and Communication Technologies with the computer revolution. Instead of refusing their impact, and creating technological islands, one has to find a way to get accustomed to them, since they are entering even in one's privacy.

3.1   Best Practices for Implementing E- and Distance Learning

The main action items and best practices to overcome constraint and realize effective Information and Communication Technologies application in education can be summarized in five classes: 1) Technology/equipment/facilities, 2) responsibility of teaching staff, 3) decision makers, 4) teaching materials & methods, and 5) funding (institutions, outside the university):

Technology/equipment/facilities: In order to make technology, equipment and facilities accessible on the campus, one needs more than just a management and planning policy that meet the local needs. These could be an appropriate library study room equipped with Information and Communication Technologies facilities. Internet Cafes on the campus can help student get accustomed to the new technologies. But reliable power supply remains for certain universities a real challenge and need to be addressed adequately. Of course one has to choose the appropriate hardware and software to not become a trash for computer waste.

Teaching staff: The major concept that will guide teaching staff is training for the use of Information and Communication Technologies for lectures. Of course, it requires willingness and motivation by both admin and teaching staff to become computer literate. To achieve this goal one needs to promote excellence in teaching, including more emphasis on Computer Aided Teaching and Learning, and more, rewards, to those lecturers who make the effort. But before that, one has to create awareness within the department to support Information and Communication Technologies.

Decision Makers: Of course, the university management must be convinced of the need for Information and Communication Technologies. This could be easier if the awareness start from the secondary education level for better diffusion and acceptance of Information and Communication Technologies. The research and higher education institutions must be stimulated to set up an association for technical consultancy. Promote the exchange of staff from different universities in the country. Decision makers should collaborate in establishing networks within universities. But the main aspects is the development of a strategy plan and also closely in getting partnerships with foreign institutions.

Teaching materials and methods: The impact of Information and Communication Technologies will be insignificant if materials and methods are not adjusted to the need of those for whom these technologies are thought. One can start with small knowledge modules (course subject) and simple examples that can be extended step by step. Seminars can be organised for presentations on Information and Communication Technologies learning (examples, case studies). The management of the research or higher education institution can reward best research work on or by Information and Communication Technologies. An Information and Commu-

nication Technologies literate staff must ensure that material is relevant to the local situation, i.e. through the use of case studies, which are locally generated. Possible route will be to insist on a minimum level of local content. A national comprehensive approach to pedagogical techniques for distance learning must be set up.

Funding institutions outside of the university: Donors must assist institutions to set up Information and Communication Technologies implementation and execution plans and providing opportunities to exchange experience between institutions. Introduce compulsory Information and Communication Technologies literacy modules (different levels, at least one week) for all incoming and outgoing lecturers and experts.

3.2   Requirements for a new Pedagogical Approach to E-Learning

For the Information and Communication Technologies one needs a new approach in pedagogical science, since the tools themselves require a new approach to education itself. Hopes put on the Internet can reveal themselves as soap bubbles if a new approach is not invented to meet the challenging requirements. The Internet must develop its own dynamics. It has its own dimension like every technology. A follow-up policy should be conceived to better implement the Information and Communication Technologies, and also to get out of its social myth character.

The Information and Communication Technologies must respect the social impact of education, then if education is selective, it remains a basic need and should not be hindered by a technology. Requirements that should be put on Information and Communication Technologies rely first of all, beyond all euphoria, on an education of proximity, as Paolo Freire developed the education for oppressed people in Latin America. Furthermore, Information and Communication Technologies must be embedded in projects that have a wider social impact and are visionary in the development. Information and Communication Technologies themselves are never the final goal of a project. They should not be favoured instead of health, nutrition, the struggle of poor against poverty etc. Information and Communication Technologies are necessary but they should be adapted to open education contexts of training and research.

4   Conclusion

We do not deny e-learning a crucial role in improving communication and information transfer. We are pleading for putting them in the right position by assign-

ing them their right role. They should be integrated in projects that will have social impact as well as the technological achievement. Health projects should not be forgotten in favour for instance of Information and Communication Technologies investment. But within the Information and Communication Technologies development itself there should be a reasonable balance between advocating investment and critically asking the positive impact.

Hamelink puts it the right way, when he states: "The dominant approach tends to focus on the development of functional skills. These are certainly important, but they have to be complemented by training, which helps people think critically about the social implications of information and communications technologies. An understanding of both their risks and benefits is essential" (Hamelink, 1998).

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