Smart education in Chad

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Abstract *—some developing countries suffer from a glaring shortness of energy and information and communication technology (ICT) equipments. It is the case of Chad, which is a landlocked country located in the heart of the African continent. This fact affects the youth education. With the rapid growth of ICT development, it is clever to ask question about teaching ICT in high schools in Chad. In this paper, we present a state of places corroborated by a field survey. We briefly analyze the results of our investigation. Finally we make some suggestions and proposals to the main actors of the education system.*

Keywords — *ICT, High school, hardware, software and education.*

I. INTRODUCTION

Information and Communication Technologies (ICT) are increasingly infiltrating the world of education in developing countries. ICT importance in the knowledge transmission is no longer a subject of controversy.

In Chad, with the willingness of government to enhance the use of information and communication technologies, as evidenced by the computerization of some ministries, the organizations of major events such as the first International Exhibition of Information Communication Technology in September 2014 and the launch of the project of the construction of African Center for Telecommunications and Information (ACTI), it is important to introduce early ICT into children's school curricula. In 2011, the Economic, Social and Cultural Council of Chad, in its policy letter on education system, proposed a gradual introduction of ICT in secondary education to improve learning. Already in 1996, UNESCO (United Nations for Education, Science and Culture Organization) encouraged states to teach computer science at the high school [1]. Indeed, this teaching will introduce to students the use of the computer and develop their critical thinking skills, their abilities in technology, their social behaviour, and their ability to act and work individually and in collaboration with a team [2, 3].

We call smart education, a learning process which uses modern technologies mainly ICT to help pupils to learn and facilitate teachers tasks. It includes education process and school administration. In this investigation, we will focus more on computer science.

At secondary schools, ICTs will serve as a working tool; that means, they will facilitate the organization of the school's activities. They will also be disciplines to teach. ICTs also have virtues for teaching other disciplines. We can use them for simulating concepts presented in the classes.

In Chad, some secondary or even primary schools have introduced computers in their schools either as a working tool or as a discipline for transmitting computer skills to students.

In this work, we will present a state of places on the teaching of computer science in secondary schools and colleges. We will conduct a survey in a few institutions. In view of the results and with our experiences in computer science teaching, we will make some suggestions and proposals to the main actors of the education system.

Our work begins with the presentation of our exploration field. Then, we analyse the result of our survey. We will make some suggestions and proposals for successful ICT education in secondary schools. Finally we conclude with perspectives of our work.

II. SURVEY IN SOME INSTITUTIONS

The introduction of computer science into the training of yougth in high school in a developing country is a fairly difficult exercise that only some ambitious institutions can afford. In fact, the introduction of ICTs in high schools requires the commitment and contribution of all educational actors. First, it requires the clear will of everybody to make this policy a success. All stakeholders in the institution should be involved in this innovation and should be informed of all important details, in particular the impact on the curriculum, the skills that students can acquire, the types of hardware and software that the school will acquire, the computer training that will be required for its staff as well as a management approach that will result. It is not just about getting computers into classrooms without upsetting the habits of parents, students, and teachers. This introduction is synonymous of the appropriation of these technologies to improve the educational practices and to provide ITC skill to pupils [3].

To get an idea of the situation of ITC at school in Chad, we did a survey in some general education institutions, to see if ICTs are used and how ICTs

are used. For that, we proposed two questionnaires: a questionnaire for students and another for teachers.

The questionnaire for students allows us to know what students think about the use of ICTs in teaching. It aims to know if students use ICT for learning. This survey focuses on the following main aspects:

a) knowledge of ICTs;
b) use of ICTs both in the classroom and outside school;
c) the use of some common hardware and software;
d) ICT preference in learning.

The questionnaire for teachers allows us to know the knowledge and skills of teachers to use ICT in their teaching. As with students, this survey focuses on the following key aspects:

a) knowledge of ICTs by teachers;
b) use of ICTs both in the classroom and outside the educational setting;
c) presence of electricity in their institutions;
d) use of some common hardware and software;
e) ICT preference in teaching.

To collect our data, from February 1st to March 31st 2017, we sent our questionnaires into high schools randomly selected and for their accessibility. We succeeded to collect data from 10 institutions in N'Djaména (Capital of Chad) and 18 institutions of secondary cities including Abéché, Bongor and Moundou. It is volunteers who participated in our survey. On 650 questionnaires sent (500 to students and 150 to teachers), 404 came back to us, a rate of 62.15%. At all, 30 institutions were solicited, 28 actually participated with 104 teachers and 300 students. The following table shows the number of institutions and number of participants (pupils and teachers) per town.

We note a large number of students from private institutions than the number of those from public institutions. This is due to their accessibility and hospitality.

Table 1: Survey participation

Town	Institutions			Pupils	Teachers
	public	private	total		
NDjamena	4	6	10	89	37
Abeché	3	4	7	56	23
Bongor	3	5	8	88	28
Moundou	3	0	3	67	16

III. RESULTS ANALYSIS

The results of our survey give us an idea of the ICT penetration rate in secondary schools. We focus our analysis on ICT knowledge, the use of ICT materials, the use of software and the desire to use ICT in the classroom. We will also zoom on the question in public institutions compared to private institutions.

A. Knowledge of ICT

We found that 72.28% of the teachers surveyed say they know computer skills, i.e. they know how to use a computer or they learnt computer science. This is an important resource for starting the smart education. Most of these teachers (64.46%) learned computer at a training center and 36.54% at the university. Regarding teachers from teacher schools, 62.96% declared learning computer science during their studies.

As far as regarding students, 49% said they knew how to use an ICT tool. 14.67% report having learned computer at school. We can note an interest that students give to computer science; 32% of them learned computer skills outside the classroom. This rate is low, but this can be justified by the difficulty of accessing computer tools. We noted that there are self-taught pupils (2.33%), they learned to use computer them-self without going through a training center.

We also note that some institutions use computers for their administrative tasks (35.71%). We did not focus on their type of use: office automation, accounting, management of materials, mail, staff or students.

B. Use of ICT materials

Most of our respondents have and use the phone: all approached teachers use the phone. In students' side, only 10.70% of students do not use phone. We did not seek to find out why they do not use phone through the survey but we dare to believe that this would be due to financial difficulties and prohibition of parents (especially for the youngest).

The use of the computer is quite interesting among respondents: 70.19% of teachers and 42.81% of students use a computer. Uses are more oriented towards extracurricular activities. Only 21.15% of teachers say they use the computer in their academic work. This low rate reflects the fact that teachers are not prepared to use ICT as a working tool. This aspect is confirmed by the pupils who do not benefit from courses taught through the computer tools (90% of students declare not having courses where computer tools are used and 4% of pupils declare using the computer for school work.).

Tablet use is relatively low, only 31.73% of teachers and 34.37% of students report using it. This can be explained by the acquisition cost.

As far as concerning MP3 players, 72.67% of surveyed students say they use them. This is an asset because they can use them for reading some audio courses (language courses, stories, etc.).

C. Use of software

We proposed a number of commonly used software to our respondents: word processing software, spreadsheet, presentation software. Most of those who say they know how to use a computer use at least one of these softwares. On the side of the teachers, 69.23% use word processing software, 61.17% use a spreadsheet program and 31.73% use presentation software (Microsoft Powerpoint). These percentages are relatively low among students and are respectively 29.43%, 23.75% and 13.31%.

In terms of programming, 80% of students and 75% of teachers do not know it. Only teachers who were graduated from universities know about programming (16,66%).

As far as regarding Internet, many respondents say they use it. We noticed that even those who do not use the computer declare making use of the internet. This can be justified by the fact that nowadays, we use more and more phones and tablets for the Internet connection especially for accessing to social networks. Many students are in this category. We can take advantage of this motivation for the Internet to explain to pupils the merits of knowing more about ICTs and especially becoming an actor.

D. Wish to use ICT in class

About the integration of ITC in schools, many respondents say they are in favor. Everyone who knows computer responded positively.

82.67% of pupils and 93.07% of teachers hope that it is interesting to introduce ICTs in schools and use them to teach. But, we note that about 7% of teachers do not share this point of view. They are those who do not know how to use computer science tools. Are they afraid of some ITC investment they have to do that they think it is expensive? They can be sensitized to the benefits of ICT in education and the benefits that students will gain during and after school.

E. Public institutions vs. private institutions

By observing the current use of ICTs in the institutions that were approached, we note that 46.15% of public institutions use computers for their administrative tasks. This is more noticeable than in private institutions where only 26.66% use a computer. However, computer science courses remain the prerogative of a small number of private institutions. It should be pointed out that the limited number of students in private schools would favor the exploitation of computer science tools, and higher tuition fees than those of public institutions could facilitate investment in ICT tools.

F. Other findings

Some students and even teachers do not know if their administration uses computer tools. Respondents from a same institution give contradictory answers. For example, in an institution, to the question of whether the administration of the school uses computer tools, 30% of students and 42.85% of teachers answered "YES" against 70% of students and 57% of teachers answered "NO". This situation can be explained by the lack of knowledge of computer tools but also by the lack of information and advertisement on these tools. However, knowing that ITC is used can bring added value to the administration of the institution by the trust of the various actors and the minimization of the risks of errors in the administrative management.

Also, electricity can be a barrier to ICT integration in secondary schools. Through our survey, it can be seen that some institutions already have electricity or use generators and others don't have electricity. While the institution in our sample are all in cities with electricity, 42.85% do not have electricity, precisely 50% in N'Djaména, 28.57% in Abéché, 37.5% in Bongor and 66% in Moundou.

In terms of status (public and private), we note that 60% of private institutions have electricity against 53.84% of public institutions.

IV. SUGGESTIONS AND PERSPECTIVES

We reminder that a successful introduction of ICT in a secondary school requires the involvement of everyone. If we look at the main actors of the education system, we can expect everyone to play a role.

The government must:

- sensitize the educational staff to the stakes of the ICT;
- set up actions which allow educational actors to get numerical acculturation ;
- encourage teachers and students to use ICT in their school and out-of-school works;
- inform and sensitize students to ICT occupations, including computer technologies, ICT concepts and developments.

The will of the government, which is already manifested in theory, has yet to be practically demonstrated. Indeed, the opinions of government members in favor of the use of ICT in the education system are unquestionable but in practice, few actions are visible. The creation of ICT Development Agency (ICTDA), with the mission of promoting ICT in the country can be considered as a practical act in favor of ICT but the ICTDA is slow to mark the steps: Even advanced education institutions do not yet really benefit from ICTDA's services. It is suggested that this institution also descend to secondary and basic education.

We suggest that government equip colleges and high schools with ICT materials needed to deliver ICT classes. It can promote ICT by facilitating access to ICT materials through the zero-rating of these materials, and also by promoting ICT training. A government policy encouraging companies and

local organizations to train their staff and to promote ICT training for youth is to be considered.

One reform to put to the credit of the government is the revision of the teachers training program with the introduction of computer science. Indeed, mathematics teachers are trained to teach computer science as well as mathematics. This training of the teachers of the college and the high school is already a precursor sign that testifies the will of the government to promote ICT in the secondary education. However, it should be noted that this initiative lacks of preparation.

In fact, this impregnation stammers for lack of qualified personnel in ICT. The higher schools training did not have qualified ICT teachers to take care of their pupils, nor did have adequate materials and tools for this training. They uses temporary teachers whose recruitment does not always take into account the quality aspect.

Parents can help their offspring to take advantage of ICT by giving them the opportunity to purchase the necessary hardware and software for their training. With the popularization of digital tablets, they can be at the center of the learning process. Most common applications have counterparts running on tablets. The basic introduction to ICT can therefore be done on these portable tools.

Teachers have a strong responsibility to set up and promote ICT in their schools. They must cooperate with each other. Indeed, the teaching experiences of ICT in the country are still nascent, know-how are still scattered. So teachers need to join hands to increase their knowledge, and to gather their know-how and build their skills. Collaboration will be needed. Experienced teachers in this area, in collaboration with the National Curricula Center (NCC), should make effort to make ICT training manuals available. In some countries, such as Germany [4], Israel [5], Canada, Greece [6], the United States [7], associations or interest groups bringing together researchers, scientists and Education experts have offered comprehensive computer science education curricula for schools. The NCC can call the Chadian associations evolving in the field of ICT (Tchad-Linux, ADIL, etc.) to the rescue, for the design of manuals. The existence of such textbooks can contribute to the creation of ICT lessons and their implementation in institutions.

Digital course materials must also be offered. It is desirable to have these supports in two formats: a short format (e.g. PowerPoint) and a long format as a text document (Word or PDF). Indeed, the short format is indicated for presentation in the classroom, it includes only the main points to highlight. It is commented and illustrated by examples presented orally during the presentation of classes. It does not have many details and there are fewer illustrative explanations. These aspects will be putted into the long format where one can expose more widely all that is necessary for understanding presented concepts. In other words, it is the format of classical text documents.

Teachers must not only teach ICT courses but also practice ICT and bring pupils to practice. They will benefit greatly from using these ICT instruments.

The introduction of ICT in secondary schools can lead to new professions and actors such as ICT educators, multimedia monitors, ICT inspectors, ICT coordinators, ICT teachers, etc.

Public institutions must be provided with the necessary infrastructure, hardware and software to deliver ICT literacy. They must have a teaching staff able to provide ICT lessons. It is up to the government to do whatever is necessary for ICT education in public institutions.

Private and community institutions must make efforts to have ICT tools for the training of their students. The introduction of ICT learning can also be a way to carve a good share of the market and to make a good reputation. Some of private institutions of the Capital (N'Djamena) advocate the teaching of computer science in primary school and even in the nursery school. If true, these messages are a beacon of hope for students in these institutions.

The partners of the Ministry of National Education (UNICEF, UNESCO, USSESCO, etc.) can support the ministry in the process of developing strategies for building smart education. Their support can range from advice and guidance to logistical support with the provision of hardware and software necessary for teaching ICT.

With the desire of each other, it is likely that ICT in general and computer science in particular find a place of expression in high schools, both as a working tool as a discipline to teach.

V. CONCLUSION

Building a smart education is essential to all and becomes a suitable way to find a place in the digital world. It will enable us to reduce the digital illiteracy rate and create smart community. In most advanced countries, digital tools are present throughout the education system. Children are prepared to fully live their era which is marked by the presence of ICT in all sectors including the tertiary sector (agriculture, livestock, etc.) and the sector of small trades (hairdressing, cooking, etc.) [2]. It is time for developing countries to look into the matter and help their youth to reach the same educational scale as developed countries.

Teaching computer science would give students mastery of the digital age and enable them to participate effectively in the evolution of the world and avoid them to be eternal consumers of the technological products [7, 8].

The teaching of ICT in secondary schools in Chad is still embryonic but can be improved. Our wish is that ICT be appropriated by all the secondary or even primary schools [6, 10]. We agree with D. Blin

Basset that [9]: "Any pupil, whatever his level, being subjected to the learning of the computer, could handle the controls, fumble, restart, look at the way of proceeding of his companions and compare the different types of work - his desire being most often to get more graphic effects on the screen -; thanks to this method, it has been possible to make significant progress for the development of computer science education ".

The introduction of ICT in secondary schools also implies the use of ICT for the administrative management of these institutions. Unlike ICT education which requires a fairly high investment, the use of ICT in the administrative management can be relatively cheap because it does not require many pre-requisites. With two computers or even a single computer and a printer, you can already start. There is no need for special infrastructure such as machine rooms and educational supports. Given the fact that the number of machines is low, this use does not imply a large consumption of electricity. Some solar panels may be sufficient even if you are in a country-side not provided with electricity.

The Government must provide schools with a variety of supports (hardware, software, technical and infrastructural) to give to students some ICT learning opportunities. It must create and make available ICT educational resources. It must organize ITC teacher trainings and provide an ICT implementation plan for schools.

As a perspective, we are planning to propose a guideline to implement a smart education in high schools. This guideline will integrate the realities of these high schools.

ACKNOWLEDGMENT

We wish to acknowledge all those pupils and teachers who accepted to participate to our survey.

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