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## Integration of the CAEx in the education (teaching) of the physical sciences in the Moroccan high school

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### Abstract

As in most parts of the country, the integration of the CAEx in the teaching of physical science in Moroccan high schools has seen an important development during the past years. The decision to implement CAEx in Moroccan education was taken by the department since 2009. From the academic year 2012/2013 the CAEx is part of the program of the CRMEF (teaching training to be able to use it). As part of a systematic research on the design of practical work by teachers of physics-chemistry of Moroccan school, we realized the majority of the experiences of the textbook of the secondary cycle which was a barrier to students in the absence of the CAEx (principale of inertia, second Newton's law, response of a RC dipole at a voltage level.. etc) A questionnaire to trainee teachers and the teachers about the use and the contribution of the CAEx to the physical science teaching in Moroccan high school. The results of this study and their interpretation are presented in this article : The time savings, presentation of the values and more accurate results, make less effort to achieve its objectives.

Keywords: CAEx, Experience, obstacle, Moroccan high school, teacher trainee/holder.

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## 1. Introduction

At the age of information, information and Communication (ICT) technology have revolutionized the pedagogy at all levels of education. Virtual communication channels offer as multifunctional as countless networking opportunities, including in the field of continuing education. While this international race to the digitalization of the formation is frantic, our Moroccan educational system remains in the shadows.

ICTs are powerful educational tools and vectors to acceleration of the human, economic and social development. To bring about effective teaching in the Morocco, the Ministry of National Education and vocational training (MENFP) shows a decade of considerable efforts to disseminate ICT in the education system. The national education and training Charter in Morocco (1999) specified in the lever 10, the goal of equality of opportunity of access to information and communication and aims, to compensate for the difficulties of teaching and training continues.

The integration of the technologies of information and communication for education (ICT) in our educational system has been a strategic decision that aims to modernize our system of education, to raise its quality and put technology at the service of the actors in this system. (CAEx) computer-aided experimentation is an important area for the use of the ICT in experimental sciences. L' CAEx allows experiments, to acquire and operate measures using the computer. The student is thus placed in a real laboratory environment to design, plan and carry out experiments in physics - chemistry such as (principle of inertia, second Newton's law, response of a RC dipole at a voltage level.. etc). The use of the CAEx releases student of measurement tasks and leaves him more time for observation, interpretation and scientific thinking. Equipment CAEx Moroccan colleges and high schools began mass in 2009.

Despite all the actions listed above, it should be noted that the current situation of ICT in physics - chemistry is agonizing and especially the use of the Cao. This is inferred internship follow-up and project of end of study of student teachers of the centre regional education and formation of grand Casablanca (class of 2015), and the testimonies of teachers from the physical sciences to high schools as well as among learners. It is good to clarify again that the integration of ICT in the teaching of physical science is far from achieving the objectives set, while research has shown that with the use of computer in physics and chemistry, student is capable of actively building his knowledge (Jalvy, Pottecher & Verollet, 1993).

As them specify (Mantha et al., 2014; El Ouidadi, 2011), the use of ICT in the Act of teaching-learning in the Morocco shows slow in school practices and it is also limited to some schools and for some disciplines.

As a first step, in this work, we will try to detect obstacles which impede the integration of the CAEx in eleven grand Casablanca provincial delegations and especially in the teaching of physical sciences for cycles College and qualifying. In a second step we are a collection of information on the types of sensors used in high schools and colleges, the appreciation of the type of teacher training teachers in the use of the CAEx the level measurement using this tool during the experiments carried out in the classroom and possibly of the benefits and advantages provided by this tool.

Finally we present the methodology and the results of our study and recommendations aimed at promoting the extension of the use of the CAEx in our high schools and colleges.

## 2. Materials and methods

This study is conducted in two public high schools in each provincial delegation of 11 delegations of the regional Academy of education and the formation of the grand Casablanca (Morocco), therefore in total 22 high schools during the school year 2014/2015. The choice of these two institutions of each delegation is done by the AREF and the CRMEF. These institutions are considered as a support for

trainee teachers (high schools where student teachers perform their MSP), it is related to facilitating the process of research reasons. The population targeted for this study consists of 44 physical sciences of secondary education teachers qualifying, 12 trainers Faculty of physical sciences CRMEF, 48 student teachers in this section which was a sample of 104. For the collection of information in relation to the problem under study, we resorted to the questionnaire and the interviews as an investigation tool.

### **2.1. The questionnaire**

The data collection was conducted through anonymous, distributed questionnaires on the eleven provincial delegations of grand Casablanca (Morocco), mainly on the two high schools public of each delegation, and CRMEF. The survey ran from the beginning of month November 2014 until the end of the month of December 2014.

The prepared questionnaire aims clear answers on 6 points fundamental objects of the survey:

1. Equipment of the institution in material the CAEx .
2. Control of the CAEx.
3. Preferably classic experience or experience with the CAEx.
4. Advantages and disadvantages of the use of the CAEx
5. Coaching and training teachers to use the CAEx.
6. Use of the CAEx class: importance and obstacles

### **2.2. Observations of settlements**

Contacts of science teachers physical and observations have been made mainly in two qualifying each delegation of secondary education institutions and an institution of higher education (CRMEF). The observation has been targeted on the presence of different types of sensors, interfaces, data Chow, number of science teachers' physical and number of classes involved in physical science.

### **2.3. Evaluation tests**

Tests were performed with trainee teachers of physical science at the CRMEF Grand Casablanca. These tests evaluate the capacity of student teachers to prepare reports, projects of end of study integrating the CAEx in physics - chemistry: experiments in chemistry - physical, educational use of the CAEx, realization of graphs with Excel.

- Maintenance and testimony

Interviews were conducted with all teachers in the physical sciences and directors of establishments involved in the investigation, the questions are open and oriented towards the CAEx integration environment and these barriers.

- Originality of this study

To make a teaching comparison between the method using the CAEx and the classic experimental method (without the CAEx), project of end of study (PFE) integrating the CAEx were made with 8 trainee teachers of the section physical chemistry at Ghent Casablanca CRMEF.

The subject of these projects is entitled "Identification of the obstacles encountered by the classic experimental method (without the CAEx), and remediation by the method using the CAEx, when the realization of the practical part of secondary program qualifying.

The result of this work shows how the method using the CAEx is required for the facilitation of the learning, the correction of the representations of learners and course planning.

### 3. Results and Discussion

#### 3.1. The integration of the CAEx in class

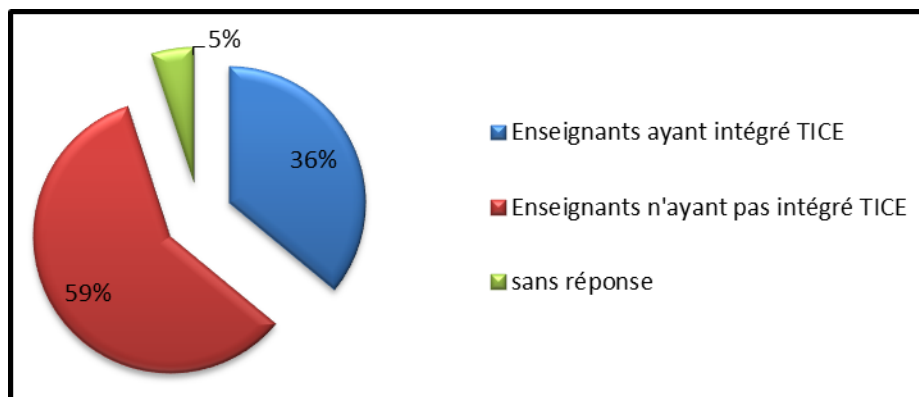


Figure 1. Percentage of physical science teachers integrating the CAEx in class.

The results revealed that more than 59% of surveyed teachers have never integrated the CAEx in education (Figure 1), 36% reported that they used the CAEx to attend some parties course learners although almost all establishments are equipped with the CAEx.

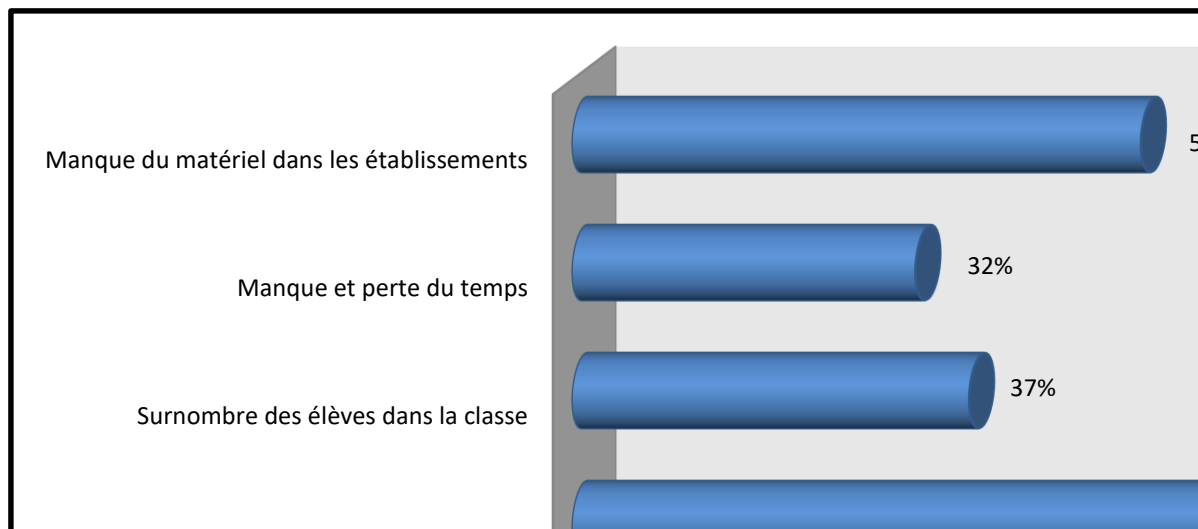
The countries of Northern Europe are those where the use of the CAEx by teachers is the most important and most widespread, for example at 90 percent in Finland, in this country most teachers say use digital tools in particular, individualized learning purposes.

In France, according to a survey by the Ministry of national education, 2008, 64% of secondary school teachers use the CAEx. In 2011, according to the Ministry of French national education Profetic survey, 77% of teachers use the CAEx with their pupils, of whom at least once a week (MEN-PROFETIC, 2011).

Our study clearly shows that the majority of teachers of physics chemistry 11 delegations of the regional Academy of education and the formation of the grand Casablanca (Morocco) do not incorporate the CAEx in practices in the classroom. On the other hand, in France, the CAEx is one of the most widespread in French schools from 1993 (Faure-Vialle, 2004). The CAEx is very convenient to teach chemistry and Physics makes individuals more student, she is able to develop a spirit of initiative among the learner and enhances its possibilities (Mantha et al., 2014).

#### 3.2. Barriers to the use of the CAEx in class

Figure 2 shows that the majority (71%) of the teachers surveyed says not to use the CAEx lack of training or the lack of computer equipment in schools (53%). Other teachers (less than 40%) consider that it is rather the lack of time and/or the overload of classes that hinder the use of the CAEx.



**Figure 2. Obstacles to the use of the CAEx in class**

In addition, maintenance with pedagogical administration officials showed other obstacles to the use of the CAEx in particular:

1. Use of time to the class and time of use of the room powered by data incompatible show;
2. Too busy schedule;
3. Lack of technical assistance to users;
4. The number of computers for each institution remains insufficient compared with the numbers of students and is often used for educational management and the preparation of examinations.
5. Insufficiency of data shows who plays an important role in the integration of the CAEx in class due to its use by all disciplines.

### **3.3. Representation of the teachers of physical science on the usefulness of the CAEX**

The results show that (100%) of teachers believe that the integration of the CAEx in education easier and improves the motivation of students and (67%) considers that the CAEx reinforces learning and (82%) say that the CAEx helps improve the pedagogy of teaching. During our interviews, more (82%) of teachers reported that the use of the CAEx helps relief task and time savings especially in the experiments. Adding to this a strong motivation of students, and interaction and also promotes the construction of new scientific concept. So we can say that the CAEx represents a solution, on the one hand to make the student more attentive, honest, which receives scientific information and engages in the learning process. On the other hand, teachers report that they become facilitators in the presentation of the lesson.

These results are also observed in several investigations in France and Europe, indeed, according to the PROFETIC study, (97%) of teachers deemed useful or very useful the CAEx in their class and this very positive perception of digital tools is not a French speciality : It occurs in all European countries (Moles, 2011).

**Table 1. Training of teachers in the CAEx.**

Category	Percentage of lessons
Easier	100%
Reinforce learning	67%
Improve the motivation of students	100%
Improve the pedagogy of teaching	82%

All teachers reported that they received a short training (from 4 to 5 days) and all are agreements that this training were inadequate. These formations were the most of time supervised by teachers and only (10%) was framed by education inspectors.

#### 4. Conclusion

The results of our survey (questionnaire, interview, draft IEPs) show that there is not a real pedagogical integration of the CAEx in practices of teaching and evaluation in physical science in the schools of the Academy of greater Casablanca. This observation was reported already in the Academy of Marrakech (El Bachari et al., 2010). The reasons are for some a lack of training in this educational tool and for others a lack of time to perform the experiments. Despite that the Ministry has managed to put at the disposal of the teachers holders and trainees training materials to the CAEx (53% ) institutions, it could not ensure the effective use of the CAEx by the teachers of physics chemistry in class. The initial training of teachers does not encourage the integration of the the CAEx. The focus should be more on step by step.

Indeed, the self-study that has a fundamental place in the computer field, should be encouraged through digital workspaces, formations remotely (El Bachari et al., 2010), contests (Abraham, 2009) innovative teachers and orientation and refresh days. Moreover, a great desire was still observed in teachers to update their 'know-how' to teach (Begum et al., 1998) and their ability to master and integrate the CAEx in education.

However, trainee teachers are excited to use this tool in the practical parts of education, must be given again attention to this new generation that can improve the level of education in the Morocco and integrate without difficulty technology in education.

Deducted IEPs of trainee teachers results show that the method using the CAEx has allowed to identify, correct, present values and more accurate results and overcome the technical and educational barriers than the classical method (without the CAEx) could not resolve. In addition this method saves time by the data processing and plotting of curves which facilitates the work of the teacher during the meeting of course to be able to complete the programme in the desired time and on the other hand to correct representations of learners and steer them in the right direction. On the other hand, it processes the data and quickly turns the algebraic values in digital and plot corresponding curves instantly while in the classical method, it is necessary to gather all the data before you build a meaningful representation. Where the method using the CAEx was able to pedagogical, technical and scientific gaps in the classical method. There are disadvantages to the use of the CAEx as a didactic tool. According to our survey (questionnaire, interview, draft IEPs), its disadvantages are that the student only manipulates manually, does not trace graph itself. Therefore it does not acquire empowers autonomy and becomes dependent on this educational tool.

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