Integration of Information and Communication Technologies in Education for Life, Earth Sciences, Physical and Chemical Sciences Teachers of the Secondary and College Level in Morocco: Reality and Aspirations

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Abstract
This study focuses to clarify the current use situation of the Information and Communication Technologies in Education (ICTE) by Moroccan teacher of Life and Earth Sciences, Physics and Chemistry sciences of the college and secondary level in their teaching practice, as well as the determinants these uses. The methodology is based on a questionnaire sent in the year 2013 to a sample of 350 teachers. The obtained results indicated that a large gap of the teachers use this technologies in teaching and learning. It is concluding that only a minority of respondents (14%) has integrating ICT in their classroom practice, although is be aware of the importance of the integration of this technology. Moreover, 37% of the population responded that the equipment is insufficient to meet their needs in classroom practice. In addition, the analysis revealed an almost total absence of pedagogical exploitation of ICT in teaching. There are several impediments to the successful use of ICT in teaching and learning.
Keywords: ICTE, Integration, Teaching, Reality and aspirations

1. Introduction

Information and communication technologies in education became one of the pillars of the modern society. Today, many countries regard the comprehension of these technologies and control their principal concepts and know-how regard as an integral part in basic education, as well as the reading, writing and calculation "UNESCO 2004 and 2011". However their diffusion are modest (Bibeau 2005). So, it is imperative to work about a training program, accompaniment and support in order to help the educational actors to take an active part in the training. In Morocco, the state makes several considerable efforts, sin ten years, to diffuse the ICT in the education system. So, the national charter of education and formation in Morocco (1999) precise the ambition of the equal opportunity of access to information and communication and aims at mitigating the difficulties of teaching and formation [The national Charter of education and formation]. The program "GENIE 2006-2013" has the objective to equip the establishments by materials and to form the teacher and administrative person. In addition, the "emergency plan 2009", aims integration of the communication technologies and the stimulation of the creativity in the training field. In the other hand, the Program "INJAZ" (October 10th 2009) aims at putting at the disposal of students a service to access and to use of the ICT.

2. Problematic and aims

In this work we try to answer to questions on about the use of ICT in teaching scientific subject in secondary qualifying and college level in Morocco:

- Is the teachers are aware of the importance of the ICT integration in their teaching practices?
- Can these teachers using ICT in their teaching practices?
- What obstacles to the ICT integration in education?
- What are the effects of the use of ICT in teaching and learning after their used?

To contribute answers to the questions listed above, the purpose of this work is firstly to reveal the current situation of the ICT in physics, Chemistry, Life and Earth sciences teaching and to define expectations about the use technique, and also identify the barriers of said integration; and proposes some solutions in the form of personal recommendations or proposed by respondent's teachers.

3. Methodology: Population and data collection instrument

We conducted a survey during the school year 2013/2014 in the questionnaire form distributed directly to 350 teachers of the secondary and collegial level spread over 26 establishments in deferent provincial delegations of

Education in Morocco. The table 1 summarized some personal information about respondents.

Table 1. Studied sample characteristics

Cycle	subject taught	Age of respondents	Teaching experience
collegial level	Life and Earth Sciences	27 years Over 45 years	4 years to over 30 years
	physical and chemical sciences		
qualifying level	Life and Earth Sciences		
	physical and chemical sciences		

It is noted that the questionnaire was written in Arabic language basing to own experience of teachers and according to the literature (Depover 1996 ; Charlier and Deschryver Daele 2002 ; Haeuw 2002 ; Larose *et al.* 2004 ; Schumacher and Coen 2008). The questionnaire is constructed by 15 questions which formed by seven parts:

- The first concerns the teachers personal information.
- The second part was focused on computer equipments.
- The third part concerns the training component and the control degree as well as educational office software.
- The fourth part was reserved for the use and importance of the ICT integration in teaching practices in the classroom.
- The fifth part was reserved to clarify if the teachers integrate the ICT in teaching practices in the classroom, used the learning scenarios explaining the organization of the activities around digital resources.
- The sixth part was reserved for the quantification question that can play the ICT integration on motivation and understanding of learners in the classroom.
- The latter question was interested to the obstacles of ICT integration in teaching and recommendations.

It is noted also that the questionnaire response percentage was 90% and the reproducibility of our questionnaire was tested with eight teachers, in order to reformulate, to consolidate and, if necessary, remove some questions.

4. Results and discussions

4.1. Characteristic of the studied sample

Table 2 represents the general characteristic of the studied sample who answered our questionnaire. It is composed of 59% of teachers and 41% of treacheries which can explain the heterogeneous of our sample. In addition, it is remarked that the majority of the teachers have an age from 35 to 45 years reflecting the old age of the studied sample.

However, the sample is composed of 50% of Life and Earth Sciences (LES) teachers and 50% of Physics and Chemistry Sciences (PCS) teachers. In addition, it has been noted in the respective proportion of each subject 32% of LES teachers and 9% of PCS teachers is the women.

Regarding the teaching experience, the majority of teachers (43%) are over 20 years of professional seniority. This assumes the aging teaching as mentioned in Table 2. This finding may be considered barriers for the analysis of the ICT integration in teaching for the two subjects. By cons, a relatively high proportion of respondents approximately 51% has professional experience ranging from 4-20 years.

Table 2. Characteristic of the studied sample

Variables	Parameters	Percentage (%)
Nature	teachers	59
	teacherses	41
Age of teachers	No response	9
	27-35 years	27
	35-45 years	47
	>45 years	17
taught Subject	Life and Earth sciences	50
	physics and chemistry	50
Teaching experience	No response	3
	4-10 years	17
	10-20 years	26
	20-30 years	31
	Over 30 years	23

4.2. Computer equipment of the establishments

Although the questionnaires data are not representative at all for the colleges and qualified schools, they make it possible to take hold of partially the equipment at disposal as of teachers. The obtained results are presented in

Figure 1. It is noted that 26% of the studied sample did not answer this question and the majority (74%) indicated that the institutions are quite equipped with computer equipment. What emerges from this proportion (74%) is what contains a fair proportion of respondents who said the equipment by discipline because of 38% ; while 23% of respondents have reported a mixed equipment between the two disciplines.

All these results are in perfect agreement with inadequate computer equipment throughout the facility as the classrooms are not yet equipped with every computer.

Figure 1. Computer equipment of the establishments

4.3. Internet in establishment

Figure 2 represents the obtained results about the internet in the establishment. It is seen that the majority of interviews (69%) report the presence of internet in their establishments but this presence is limited only to administration service. In addition, 17% of the interviews said the lack of internet in their establishment against 14% who did not answer this question. it is seem for these results that many efforts and progress can still be made in terms of integration and use of ICT by officials in the establishment.
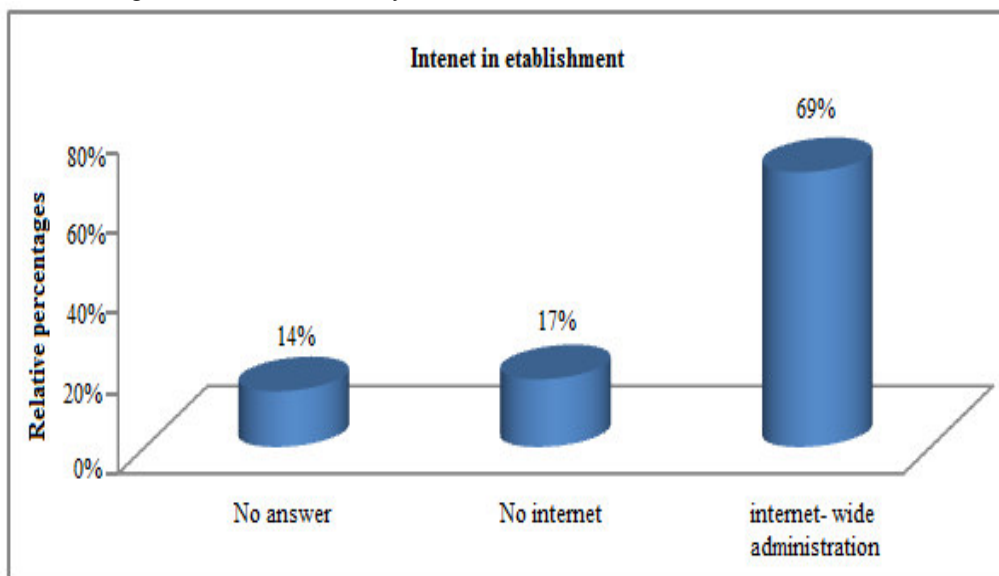

Figure 2. Equipment of internet establishments

4.4. Computer knowledge and its importance

Figure 3 presents the expertise for teacher about computer knowledge. It is noted that the majority of teachers (37%) have how a low level of computer knowledge and does not control the use of software. This deficiency would affect probably the choice of digital resources and integration of ICT in teaching practices. In addition, 29% of teachers say they have little mastered to use some software like MS Word and MS Excel. So, a significant portion of teachers (23%) said it is powerless about ICT environment and 13% not responded to this
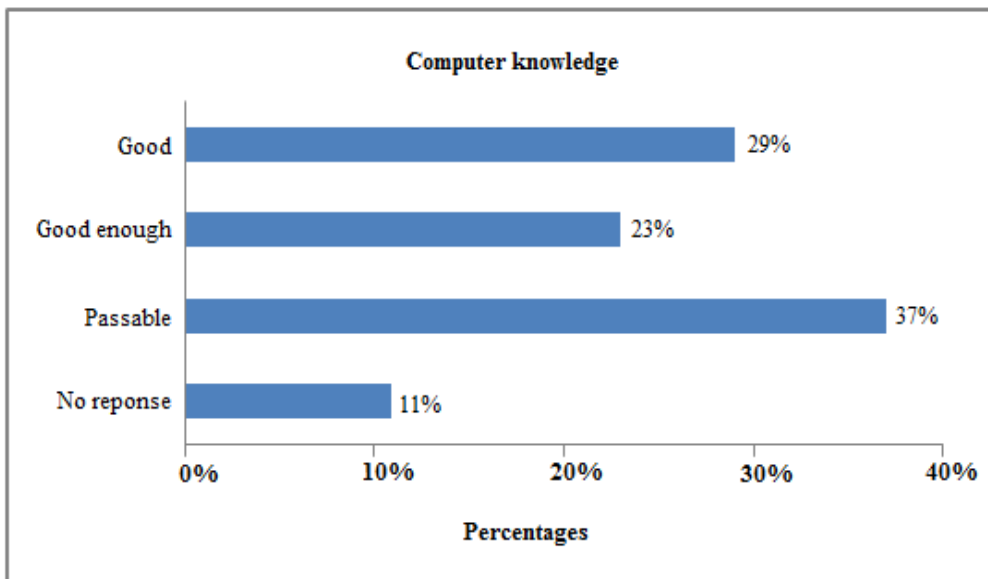
question.

Figure 3. Teacher expertise in computer knowledge

However, the result presented in Figure 4; show that 91% of teachers believe the importance of ICT integration in teaching practices. This result can reveal very important information, namely that teachers are aware of the benefits of the ICT integration in teaching practices.
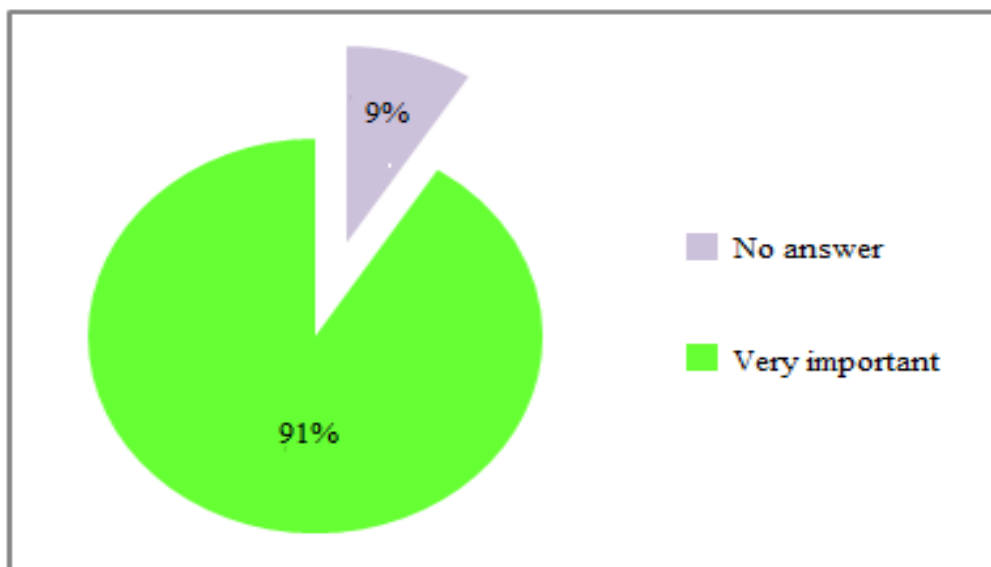

Figure 4. Importance of ICT integration in teaching practice

4.5. Training type in the use of ICT
This question reports on training methods for teachers during their career training and self-training in ICT. Figure 5 presents the training type in the use of ICT. It is remarked that the majority of teachers (34%) have never received ICT training throughout their working while 23% of teachers report having received training in ICT. This finding raises the issue of adoption and the spread of this training to all teachers. It is noted also that 28%, 6% and 3% of teachers have a self-training, university training or training at teaching center, respectively.

This leads us to reflect seriously on the objectives training are reduced for the benefit of reflections devoted to aspects of content. Indeed, the part relating to the accompaniment of beneficiaries after completion of training should be considered.

However, all respondents confirmed that he has never received real training focused on TIC in the educational activities of the subjects taught.
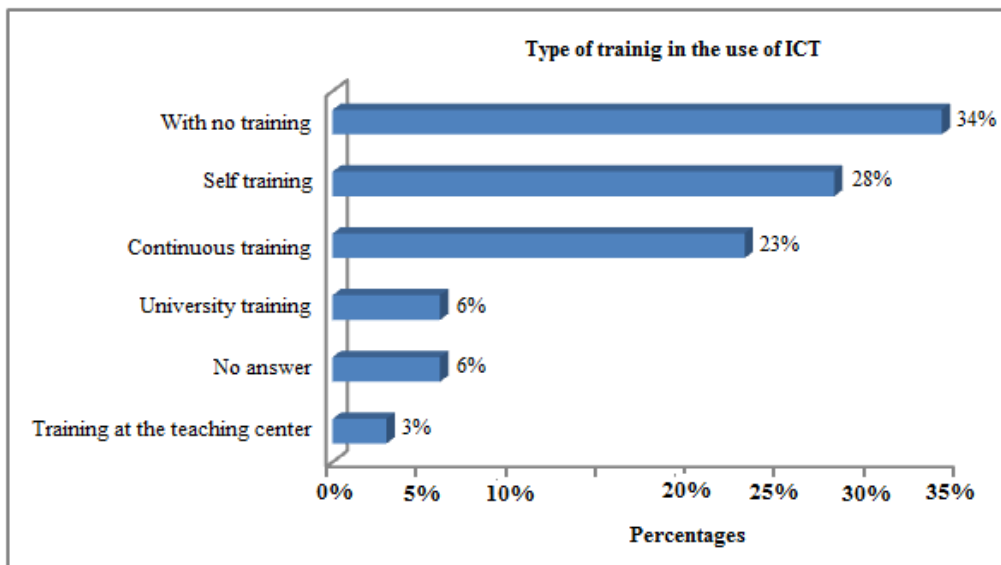
Figure 5. Population distribution by type of training in terms of TIC

4.6. ICT integration in teaching practices

Figure 6 presents the percentage of the ICT integration in teaching training practices. It is remarked that a great percentage of teachers (79%) did not use the ICT in teaching practices. This result is in perfect disagreement with the previous result mentioned above. Indeed, it is found that 7% of responses did not have any experience in ICT. This can be probably explained by the fact that the teachers still retain traditional approaches and they are afraid of the unknown and of all that is new, or their ideology. They can be also explained by the lack of necessary equipment for the ICT integration in classroom practices or lack of training in the area said.
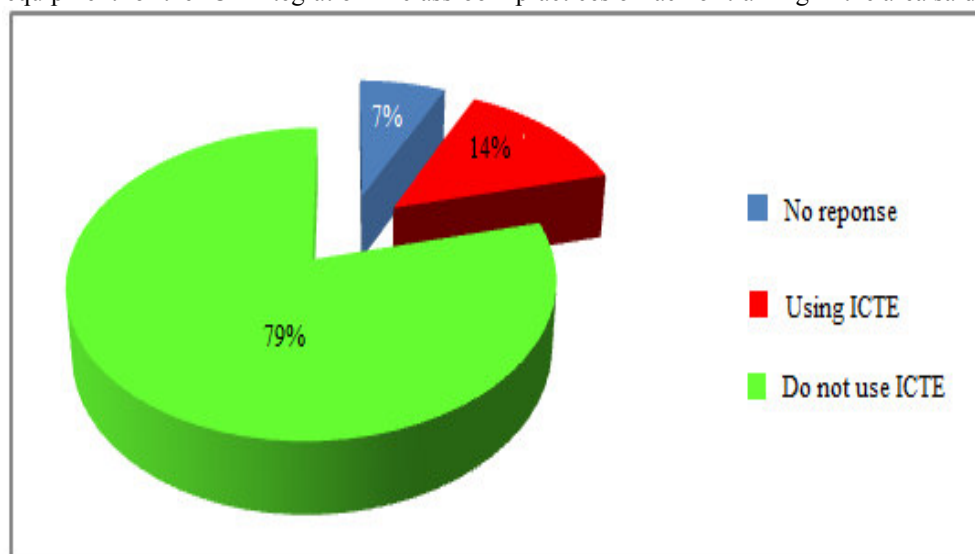

Figure 6. ICT integration in teaching practice

4.7. Types of digital resources used by teachers

As noted above quotes 50 of the 350 respondents are users of ICT in their classroom practices. It was interesting to know the digital resources types used by these teachers. The obtained result are presented in Figure 7. It is noted that 60% of teachers use images, 16% use text, 12% use the video while 4% use software. It can be say that these are still unknown or poorly controlled by a great number of teachers although it is an important resource of information.
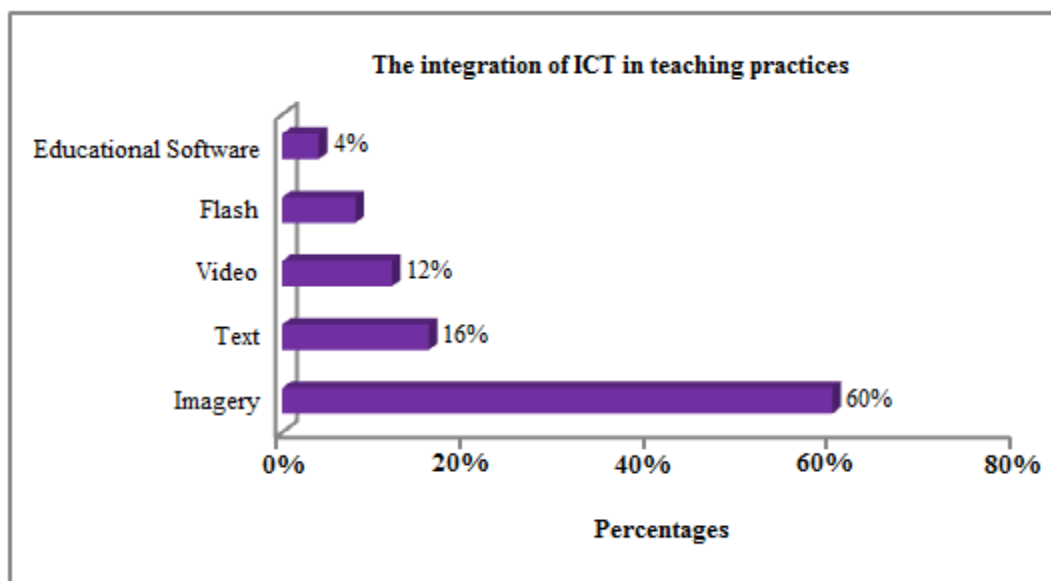
Figure 7. Types of digital resources used by teachers

4.8. Impact of the ICT integration on learners

All respondents who have used ICT confirm an example of previous investigation by other researchers. Thus, the use of ICT in physical and chemical science and life and land science contributes one hand, the ease and growth of concentration and increasing learning motivation of students as was reported by (Becker 2000 ; Hennessy 2000 ; Bibeau 2007). It is also promoted interactions between students and between teachers and students (Newman 1994 ; West 1995; Valdez *et al.* 1999). It also is increased a student achievement (McKinnon Nolan and Sinclair 1996); and secondly, students appreciate advantage sessions where the teacher uses ICT.

4.9. Obstacles to the integration of ICTE

It has often found that most respondents also consider their use of ICT in the classroom is very timid and limited by certain constraints. Recall that the majority of teachers (43%) have more than 20 years of professional seniority involving aging of teachers. According (Karsenti 2004 b), this profile could be a factor of resistance to innovation. In addition, Figure 8 shows the obtained results. It is noted that 37% of teachers felt the one hand, the material within the facilities is insufficient to meet their needs classroom practice and secondly, the lack of digital resources and updated referential phenomena studied. However, 34% of teachers surveyed lack sufficient in ICT training. These results correlate with those reported by (El Ouidadi *et al.* 2011). In addition, 20% of teachers expressed unambiguously that the choice of appropriate digital resources to use them for learning is difficult and beyond their more this choice requires a lot of time for internet research, and most of these resources are in French or English languages so they provide a classroom teaching Arabic language which is often a handicap for them. These results correlate with those reported by (El Ouidadi *et al.* 2011). Finally, 6% of respondents point out that the change of science rooms from other rooms not equipped with computer limit the ICT use in their teaching practices.
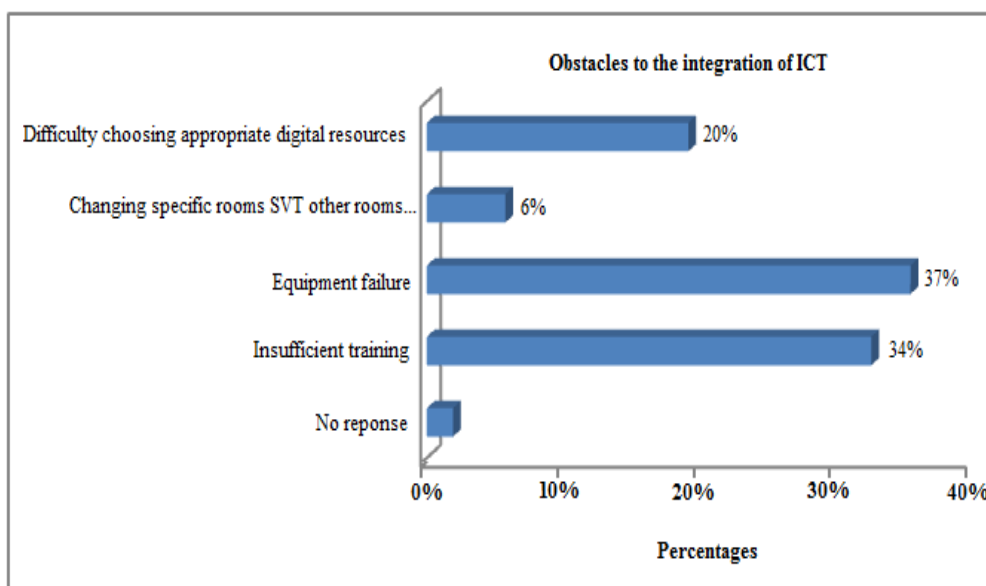
Figure 8. Obstacles to the integration of TIC

5. Conclusion

It is noted that use of ICT in schools, is both an opportunity and a challenge for the education system and training. Respondents are aware that it is essential to integrate ICT in their teaching to teach learners to understand, to help them acquire the knowledge and skills they are often unable to communicate their .

However, the results of our investigation indicated that in the field of ICT integration in teacher classroom practices is not up to the institutional demand. Indeed, to the old of teachers which could be a factor of resistance to innovation (Karsenti 2004 b) Respondents also believe that their ICT use in the classroom is facing a triple challenge:

- Training problems is still appropriate: the inadequacy or the lack of training.
- The lack or the inadequacy of computer hardware and educational digital resources in schools.
- Difficulty of choosing qualified and reliable digital resources websites and their rational integration into learning through a well-developed lesson plan.

These results are similar to those obtained by Komis *et al*. (2010).

6. Recommendation

In view of the obtained results, it is seem that many efforts and progress can still be made to the successful of ICT integration in teaching practices. To this end, we propose some solutions in the personal recommendations form or proposed by respondent's teachers so that they can overcome the obstacles for ICT use:

- Developing the ICT use to enhance teaching and learning in Morocco Schools.
- Require more time for training and more computers in order to further control the whole process of ICT integration in their teaching practices.
- Require the making available of digital resources qualified and many reliable.
- Wish accompaniment so that they master the ICT use, they take ownership; they serve as levers to innovate in their teaching practices to develop in students the worship of learning and to respond to development of education. These ideas are indicated by (Bibeau. 2005).
- Make a great effort for the translation into national languages teaching for the digital resources.

So it seems essential to continue research to understand how to help practicing teachers to move towards integration of increasingly effective ICT and gradually allow students to learn more and better through these tools. In the same perspective, a research program to investigate the effects of ICT use on learning matters is required.

References

Becker, H.J. (2000)**,** "Pedagogical motivations for pupil computer use that lead to student engagement", Educational Technology 40, (5), 5-17.

Bibeau, R. (2007)**,** "Les Technologies de l'Information et de la Communication peuvent contribuer à améliorer les résultats scolaires des élèves", http://www.epi.asso.fr/revue/articles/a0704b.htm (May 8, 2014).

Bibeau, R. (2005)**,** "Les TIC à l'école : proposition de taxonomie et analyse des obstacles à leur intégration",

Revue électronique de l'EPI, Paris, http://www.epi.asso.fr/revue/articles/a0511a.htm. (May 8, 2014).

Bibeau, R. (2004)**,** "Taxonomie des ressources numériques normalisées : vers un patrimoine éducatif", VIe Journées de l'Innovation, Foix (France), 28 Janvier 2004. http://ntic.org/guider/textes/normalisation/toulouse.html. (June 28, 2012).

Charlier, B., Daele, A., et Deschryver, N. (2002), "Vers une approche intégrée des technologies de l'information et de la communication dans les pratiques d'enseignement", *Revue des sciences de l'éducation.* 28 (2), 345-365.

Depover, C. (1996)**,** "Le chemin de l'école croisera-t-il un jour celui des nouvelles technologies"? http://edutice.archives-ouvertes.fr/edutice-00000822/en/. (October 8, 2013).

El Ouidadi, O., Essafi, K., Aboutajdyne, M., Sendide, K., et Depiereux, E. (2011)**,** "Analyse d'attitudes et de besoins d'enseignants marocainsenTICE : cas de l'académie (AREF) de FES-Boulemane, Maroc". *Revue africaine de didactique des sciences et des mathématiques (RADISMA),* 7. http://www.radisma.info. (June 28, 2012).

Hennesy, S. (2000)**,** "Graphing investigations using portable (palmtop) technology". *Journal of Computer Assisted Learning*, 16, 243-258.

Haeuw, F., Coulon, A., Even, N., Jacquemard, C., et Spraul, C. (2002), "Analyse des besoins de formation des personnels de l'enseignement supérieur à l'usage des TICE dans le processus enseigner-apprendre", Paris : *ALGORA*, 55p.

Karsenti, T. (2004 b)**,** "Les futurs enseignants du Québec sont-ils bien préparés à intégrer les TICE"? *Vie pédagogique*,132, 45-49.

 Komis, V., Dagdilelis V., Koutsogiannis D., Kynigos C., Psyllos D., & Zagouras C. (2010)**,** "Des ordinateurs portables au collège grec : les défis d'une expérience en cours". *78ème Congrès de l'ACFAS*, 10-14 mai 2010, Université de Montréal, Montréal, Canada.

Larose, F., Grenon, V. & Palm, S.B. (2004), "Enquête sur l'état des pratiques d'appropriation et de mise en oeuvre des ressources informatiques par les enseignantes et les enseignants du Québec". *CRIE-CRIFPE . Sherbrooke* : CRIE-CRIFPE.

Mc Kinnon, D. H., Nolan, C.J.P., et Sinclair, K.E. (1996), "The Freyberg integrated studies project in New Zealand : A longitudinal study of secondary students' attitudes toward computers, their motivation and performance". *International conferences on technology and education*.

Newman, D. (1994), "Computer networks : opportunities or obstacles? In Means, B. (ED). Technology and education reform. The reality behind the promise". San Francisco, CA : Jossey Bass. XXIV et 232p.

Schumacher, J.A., et Coen, P.F. (2008), "Les enseignants fribourgeois face aux TIC : quelle alphabétisation, quelle(s) intégration(s) " ? *Formation et pratiques d'enseignement en questions*, 7, 51- 71.

Sheingold, K., et Hadley, M. (1990), "Accomplished teachers: Integrating computers into classroom practice". *New York: Center for Technology in Education, Bank Street College of Education*.

UNESCO, (2011), "Un référentiel de compétences pour les enseignants". http://unesdoc.unesco.org/images/0021/002169/216910f.pdf. (october 18, 2012).

UNESCO, (2004), "Technologies de l'information et de la communication en education". http://www.cse.ma/fr/files/Charte_education_formation.pdf. (october 18, 2012).

West, P. (1995), "With computers, Apple project finds less may be more". *Education Week*, XV, (11), 6.