



Integration of ICT in science teaching – a study performed in Azores, Portugal

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The present work intends to give the results of a questionnaire elaborated to gather the main difficulties of ICT integration in the teaching of sciences, at a moment that they are to be implemented in Portugal new programs of science. The work is included in a deep study about the application of ICT in Physics and Chemistry teachers in training taken place in the different islands of Azores. Some of the coming results of the descriptive study indicate some of the main reasons for the non-integration of ICT in the schools such as the existence of conceptions on the use of ICT, the lack of the teachers formation and the lack of material and human resources in the schools.

Keywords: ICT in the sciences teaching, integration elements, pre-service and in-service teacher training.

1. Introduction

The information and communication technologies (ICT) assume a deep strong and constant presence near daily human being activities. They contain the necessary ingredients to push the change that the school needs in the beginning of this century. The school has to be a space where the construction of knowledge and social improvement are operated in a way that student feels as human being with interests and own needs. It's in this scenery that we should fit the challenges placed to the schools by technologies and guarantee that the new generations take the best part of that world of information. This world is its own complete disposal as well as it's also the producer of new knowledge and learning. The amount of information given by the net and media it's a reality and to obtain the best part from her it's essential to have a good basic scholar formation [1].

By this way, school will have to suffer changes and innovation in order to answer to the demands of nowadays society. The efficient integration of ICT in scholarship daily can contribute for that changes may occur. In this order, the integration of ICT should be base in a wide range strategy whose orientation lines establish three main subjects: should appear integrated in curricular context, integrate in renewal pedagogic politics of the school and it should have an adapted teachers formation. Concerning the first point, the national curriculum in Portugal supports in an explicit way its integration in the plan contents. Even so, the majority of schools don't observe in its formative plans a politic of intention for the use of ICT. They are still many the limitations that work as barriers to an effective integration of ICT in the teaching. Then, it matters to know what kinds of obstacles are against to its accomplishment.

At a time that in the Portuguese Secondary teaching it's carried out a curricular reorganization, it seems very important to know which are the main difficulties of ICT integration in teaching. Specially, we try to do these rising in the Physics and Chemistry teaching in schools of different islands of Azores archipelago.

2. The study

The study carried out is included on a wide investigation work that had as main purpose to analyse the conditions that provide an efficient implementation of a work strategy of network training teachers, cre-

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ating materials and studying ways of communication and of results discussion as well as its own evaluation instruments [2, 3].

Through this investigation we observe that the future teacher's professional and personal development cannot be seen as an isolated and solitary process as happens at the most of the time. It should be a process shared by those who are involved in the formation including the school community where the professional is inserted. In this way, we think that the formation made in the network can allow a better ICT integration in sciences teaching. The creation of learning communities can be one of the strategies for the success in the ICT implementation in schools.

The study was taken place in the years of 2002/2003 and 2003/2004. For that purpose, we organized a questionnaire driven to Physics and Chemistry teachers of schools placed in different islands of Azores archipelago.

The questionnaire was divided in three parts, being:

- the part **A** intended to characterize personal and professionally the teachers of the sample;
- the part **B** aimed to analyse the teachers formation for the ICT integration in schools and for the teaching of the new Physics and Chemistry plans;
- the part **C** determined to analyse the present conditions in the school for the ICT efficient integration as well as for the teaching of new plans.

The questionnaire was applied in paper support. However, in some schools, it was applied through PC support using the e-mail.

3. Results

We began by characterizing the teachers that answered to the questionnaire. The target population was Physical and Chemistry teachers who teach in schools of different islands of Azores archipelago. Concerning to the human and material resources the schools are different due to the geographical dispersion of the archipelago.

Most of those inquired answered to the questionnaire. It presents an average age less than 30 years, finding out that the majority are females. 74% of the teachers only have 1 to 5 years of teaching experience, and 54% of the inquired teachers have a permanent position in the teaching staff of the schools where they work.

From the analysis made to the questionnaires we point out some of the results which reveal aspects that can be obstacles to the ICT integration in the sciences teaching but also signs of hope in a more harmonious future with desirable changes.

Aspects that act as obstacle:

- Lack of appropriate material resources;
- Lack of formation in the new information and communication technologies area (digital literacy);
- Lack of formation concerning the use of technologies in sciences specific area;

- Misconception, namely the loss of teacher importance and the idea that the use of ICT is a loss of time.

Aspects that act as restriction:

- Lack of pedagogic and didactic formation of how to use ICT in classroom context;
- Lack of appropriate infrastructures;
- Resistance to the change from teachers concerning the use of new strategies and methodologies defended by the didactic investigation of sciences;
- Support lack of a technician with formation in ICT area.
- Little sensitivity of educational community, ignoring the potentialities of the ICT use;
- Lack of cooperative work among teachers who teach the same matter.

The main reasons that take the teachers not use the ICT in the classroom:

- Lack of appropriate material resources;
- Formation lack in ICT;
- Formation lack on the new plans;
- Lack of time, because it's necessary to accomplish the plans.

Some referred aspects that can contribute to become easier the integration of ICT in the sciences teaching:

- Young teaching staff;
- The majority of teachers have a permanent position in the teaching staff of the schools where they work;
- The majority of the schools are equipped with computers and peripherals;
- The existence of teacher training in the schools;
- The possibility of workgroups creation.

These results reinforce the conviction that the teachers formation is indispensable respecting to contribute for the fulfilment of active pedagogies and reformist attitudes in the education. However, it's necessary to have a clear notion of its possibilities and limits because the formation doesn't allow passing beyond all the difficulties. The fact of teaching staff being young can provide the ICT integration due to its recent formation. Nevertheless, these teachers due to its little experience and in circumstances that they don't trust in their work and in their competences, may have fear to apply the new technologies. Due to this fact students cannot be conducted into a significant learning. A heterogeneous teaching staff can be useful for the development of a cooperative work where everyone has different experiences to share.

One of the fundamental conditions to the ICT integration in the teaching is its integration in the curriculum. Relatively to Physics and Chemistry matters the new Portuguese plans already include practices that emphasize ICT. However, most of the teachers (86%) told that they didn't received any formation about the matter new programs to be apply in classrooms. 85% of those inquired tell that the schools don't organised/developed sessions in the way of motivate the teachers to integrate ICT in its practices. Just two schools of the region accomplish in 2003/2004 formation proceedings with that goal.

Other aspects able to stimulate ICT integration in schools are related to the implementation of actions guided for its use and the need of an evaluation of the students having by principle the pedagogic prac-

tices based on ICT. From the analysis of the inquiry we may also refer that some teachers showed receptivity for develop methodologies of cooperative work where there are share and debate of experiences and to participate in school projects with resource to ICT (blogs; Internet pages; e-newspapers; etc.). In this sense, will exist the possibility to create learning and share communities. Nevertheless, most of the inquired reveals that there are no moments of share and discussion among the teachers and no creation of debate spaces. The lack of situations where cooperative work is developed conducts teachers to work alone.

The analysis to the questionnaires reveals that the supervisors of the schools, where teacher training take place, learn with the teachers in training practices. We can conclude that the presence of teachers in training in schools is useful for the schools supervisors as well as for the remaining teachers who have the opportunity to work with them, because they are messengers of new ideas and of renewal practices.

4. Conclusions

We observe that some misconceptions still exist concerning the use of ICT in educational context. Many teachers recognize that ICT are indispensable instruments to the development of essential competences in the students. However, the majority of teachers continue to look for ICT as something that is good for motivating. Others, on its turn, refer that ICT are effective to motivate students for learning but they aren't for teachers to reach certain goals related to contents indicated in the plans. To fulfil these lacks are necessary the development of cooperative and collaborative work among the several teachers, because in that kind of work each teacher is simultaneously teacher and student. This would be a way to carry out the lack of formation of some teachers, of increasing the motivation for the use of ICT, of thinking about the practices for an improvement of the teaching process and the students learning and to develop in the sense of making that schools be able to form citizens able of adapting to the demands of the XXI century. By this way, the learning communities formation can be one of the strategies for the success in the implementation of ICT in schools once the collaborative work developed among the participants is addressed mostly to pedagogic concerns rather than technical component. The resource of this type of communities makes easy the share and allows the elaboration of didactic material with support in ICT.

If, in one side, the reference in an explicit way to ICT in the programs and in the manuals can make easier its integration in teaching, on the other hand, we observe that there is still much more to do concerning the pre-service and in-service teacher training. It is necessary to think in an appropriate way about this subject in order to not create anxiety and lack of motivation of teachers.

How faster go the change and the adaptation of the teachers to the use of ICT, more quickly they will be familiarized with its use. Even so, that adaptation will have to be done in a way that individual differences must be taking into account. A fast change can lead to the lack of motivation of those who didn't have so much ability for using these resources. In the same mode, a slow change cannot also be useful and can conduct to the same result.

Overall, the schools need to ponder its projects to make easier and to become aware the educational community for use of ITC.

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