A Portuguese perspective on continuous training in ICT: essential or mere accreditation?

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Abstract
This paper presents a research study conducted with two groups of teachers from different schools and curricular subject areas within the context of the official continuous training program in a workshop context on interactive whiteboards. A survey evaluating ICT literacy, as well as the satisfaction level of teachers regarding the type of training program they had attended was driven at the end of the training program. After nine months of its implementation, half the teachers were contacted again to conduct another survey on the applicability of the training program they had attended in order to know/understand the possible changes in their teaching practices. All teachers considered that ICT can influence and improve the quality of education. As main reasons reported for not using ICT in the classroom relate to: inadequate training, lack of time to plan activities, lack of technical knowledge, lack of time to experiment and lack of time to attend training courses. After the training, most of teachers considered having a good or very good level of competence in using ICT, showing an increase in self-esteem towards the use of educational technologies. On the use of interactive whiteboards in the classroom context, about one-third usually use them frequently.

Keywords: Continuous Training, ICT, TPACK.

1. Introduction
The Continuous Education in a Workshop Context, with an actual practice, was the training model implemented in this case. After nine months of its implementation, we chose to carry out an evaluation study aimed at teachers who attended the workshop, using a survey to collect data. This study was intended to assess the satisfaction level of teachers who underwent the training, the level of replication of the same and their use in everyday work.

The training was given in two classes of 20 teachers each, one consisting of teachers who were teaching in Guimarães and another in Celorico de Basto.

First we explain some of the initiatives that Portuguese government had in the last twenty-five years to promote Information and Communication Technologies (ICT), then the issue of technology's integration at schools that has been the subject of recent interest from many researchers, detailing the theoretical framework called Technological Pedagogical Content Knowledge or, abbreviated, TPACK. And because the training was about Interactive Whiteboards, we describe some of the research done about its use in classroom context. After this introduction we refer the methodology, results and conclusions obtained with this investigation.
2. Educational Technology in Portugal

Over the past twenty-five years, there have been several initiatives to promote Information and Communication Technologies in Portuguese schools. The first project financed by the Ministry of Education took place between 1985 and 1994 and was called MINERVA (Computer Tools in Education: Rationalization, Valuation, Update), having as objectives, in addition to equipping schools with computer equipment, to provide training for teachers to use and develop educational software, trying to promote research on ICT use (Cole, Miller, Veiga & Tomé, 1997, p. 45). Between 1996 and 2002, it was developed the program Nónio XXIth Century (Information and Communication Technologies Program in Education) for the purpose of an application and development of ICT, the ICT training and the creation and development of educational software and the diffusion of information and international cooperation (ibidem, p. 45-46). Between 1997 and 2003, it was developed the initiative uARTE (Support Unit of Telematic Educational Network), contributing to the process of installing and connecting schools to the Internet (Davis, 1999).

In the perspective of continuing the program Nónio XXIth Century, the Ministry of Education in 2005 created the Edutic (Unit for the development of ICT in Education) in GIASE (Office of Information and Evaluation of Educational System) and transferred the same year its functions to the Mission Team CRIE (Computers, Networks and Internet in Schools), which ran under the DGIDC (Directorate-General for Innovation and Curriculum Development) and which ended in 2007. It had the "mission to design, develop, implementation and evaluation initiatives and mobilizing in the field of integrative use of computers, networks and Internet in schools and the processes of teaching and learning" (Order No. 793/2005 16). By Ordinance No. 18871/2008, the functions of the team CRIE were transferred to ERTE / PTE (Team Resources and Educational Technology/Educational Technology Plan), aiming the "development of curriculum integration of ICT in primary and secondary schools, promoting and facilitating the use of computers, networks and the Internet in schools; the design, manufacture and delivery of digital educational resources and guidance and monitoring of activity to support schools developed by the Centres of Competence in Educational Technology and the ICT Regional Support Centres".

3. Integration of ICT at School

The issue of technology’s integration at schools has been the subject of recent interest from many researchers who analyze it from different perspectives and viewpoints. Everyone tries to find reasons to justify both success stories and the failure of ICT curriculum integration, but the converging views of the vast majority of authors in relation to the view that an effective integration of ICT into the curriculum requires investment in two areas - attitude of teachers and an adequate training for its use (Costa & Peralta, 2007; Silva & Miranda, 2005).

However, this are empirical findings resulting from a lot of research work that has been accomplished in the field of education, but which has lacked a theoretical framework in support of research and that could unify the terminology used by different researchers.

In order to bridge this gap, Punya Mishra and Matthew Koehler presented, in 2006, a new theoretical framework they called Technological Pedagogical Content Knowledge or, abbreviated, TPACK (Mishra & Koehler, 2006). The basic premise behind the concept of TPACK is that the attitude of a teacher with regard to technology is multifaceted and that an optimum combination to the integration of ICT into the curriculum results from a balanced blend of knowledge to the scientific or content level, the educational level and also the technological level (Koehler & Mishra 2008). Figure 1, adapted from Koehler and Mishra (2008), graphically represents the concept of TPACK as the result of the intersection of knowledge from a teacher at three levels: knowledge of curriculum content, teaching methods and also the skills and technological level.
In theoretical terms and according to Koehler and Mirsha (2006, 2008), TPACK results from the intersection of three different types of knowledge:

The **Pedagogical Content Knowledge**: namely, the ability to teach a particular curriculum content;

The **Technological Content Knowledge**: namely, whether to select the most appropriate technological resources to communicate a specific curriculum content;

The **Technological Pedagogical Knowledge**: that is, knowing how to use these resources in the teaching and learning process.

For Harris and Hoffer (2009) the concept of TPACK is an extension of the concept of "pedagogical content knowledge" presented by Shulman in 1986, and came to revolutionize the understanding we have today of how it handles the professional development of a competent teacher in his curriculum area. The rapid development of computer and Internet as tools to support the teaching and learning process, justify the necessity for a framework that supports those who should be the responsibilities of a teacher that uses ICT in the classroom as cognitive tools, as recommended by David Jonassen (2007).

According to Koehler and Mishra (2008), TPACK is the basis of effective teaching with technology and a condition for an effective integration of ICT in curricular activities. Its field requires an understanding by the teacher from teaching techniques that enable technologies to be used towards the construction of knowledge by the student and not only as a support for the teacher to teach.

Accordingly, teacher training should be directed to the gradual and spiral development of the TPACK. Starting the training always with simple technologies and known by the teachers, towards applications increasingly complex and sophisticated. At the bottom, what is intended is that the teacher is able to make informed decisions in the design of their teaching activities with the technologies, which assumes:
Choice of educational objectives;
Decision making at the pedagogical level given the nature of the learning experience;
Select and sequence learning activities;
Select strategies for formative and summative assessment most appropriate to the type of teaching strategy adopted;
Select the best resources and tools that help students benefit from learning the activities planned.

We all wish the success of our students, and research shows that the use of ICT for teaching purposes is a source of motivation and educational innovation (Coutinho, 2009; Ricoy & Couto, 2009). In Portugal, by the end of the year 2010, it was expected the ratio of one computer for every two students. That's why the questions raised by Ricoy and Couto (2009, p. 147) make sense: "But what's the importance of all this equipment if teachers do not meet the challenge of modernization and innovation and students use ICT to purposes that are not wanted? It will therefore be necessary for teachers to see the new technological tools as an ally in the arduous task of motivating, engaging, and awaken to the path of knowledge."

This involves training teachers and it must necessarily go through the design of training models that meet the integrated development of teaching skills in accordance with the reference of TPACK (Coutinho & Bottentuit Junior, 2009).

4. Interactive whiteboards

Interactive whiteboards are intended to enhance interactivity in the teaching/learning process. According to Bell (2002) and BECTA (2003), using interactive whiteboards in classroom context allows greater integration of ICT in our schools, there is the possibility to take notes during class, student record reviews, save and print these notes, increases the realization of more dynamic presentations, the use of games, colours, images, Internet, software..., lessons become more interesting and more complex concepts are easier to understand. Thus, the versatility and adaptability to different age levels and subject areas allows increased interaction and discussion in class. The concentration of various resources in the same class support makes it more dynamic.

Despite the novelty for most Portuguese schools, at international level there are several studies on the use of interactive whiteboards in classroom context (BECTA, 2006; Higgins, Beauchamp, Miller, 2007; Miller, Glover, Aver, Door, 2005). Beeland (2002) conducted a study with 197 students and 10 teachers and concluded that students enjoy learning with interactive whiteboards, and that this educational tool can be used in classrooms to increase students’ engagement in the teaching/learning process. In Portugal, research on the topic is beginning to emerge, having already been carried out some investigations by Meireles (2006) and Ferreira (2009), discussed the potential of interactive whiteboards by Sampaio and Coutinho (2008a), Sampaio (2008), Neves and Garcia (2009).

ICT if used well can produce very positive results in various contexts (Sampaio & Coutinho, 2008b). But despite the change that technology can bring to our classrooms, it’s the use that teachers make with it that affects the learning environment (Armstrong et al, 2005; Lewin, Somekh, Steadman, 2008; Wood, Ashfield, 2008). In fact, the benefits mentioned only occur when the skills of teachers in its use are not limited. Despite the increase of available computers and better infrastructure, the information and communication technologies are still used in unsatisfactory level (Costa et al., 2008, p. 28).
5. Methodology

In this investigation we used the survey in an attempt to describe the reality of the continuous training for teachers. In particular on the use of ICT and the level of satisfaction regarding the type of training they had done.

Particularly, we intended to get information on the use of ICT by teachers and specifically for interactive whiteboards; the influence of ICT in their teaching practices and training; the reasons for not using ICT with students and future needs for training. The questionnaire consisted of six personal questions relating to the identification of the respondent, fifteen multiple-choice questions and seven open-ended questions of short answer.

After nine months of its implementation, half the teachers was again contacted to conduct another survey on the applicability of the training they had participated in order to know/understand the possible changes in their teaching practices. In this case, the questionnaire has already been answered online, anonymously, and consisted of six multiple-choice questions and three open-ended questions of short answer.

6. Results

It was applied a survey to teachers of different subjects, different schools and with very different service time, a total of 40. Just over a third (37,5%) of teachers had used an interactive whiteboard and of these nearly half (46,7%) had only used as a blank screen of a projector, a third (33,3%) had features used in the same handwriting, and only 20% had made full use of it, pointing out that these 3 are Mathematics teachers. Of the 40 teachers, 9 had already attended a workshop on interactive whiteboards. They all stated that the school has different interactive whiteboards, but not in all classrooms. It was found that over half (65%) of teachers often use ICT in the classroom, having considered all that the use of ICT in education and training is important because it is essential to the quality of education (30%), is a way of motivating students (25%) because we live in an information society and we need to be constantly updated (10%) and the way the lesson is exposed by using, for example, the slide show (5%). Three quarters believe they have a good level or reasonable competency in the use of ICT in their teaching. All teachers considered that ICT can contribute significantly or at least influence and improve the quality of education. As main reasons reported for not using ICT in the classroom relate to: inadequate training in the use of technology (70%), lack of time to plan activities which integrate ICT (65%), lack of technical knowledge (55%), lack of time to experiment with ICT (50%) and lack of time to attend training courses (50%).

For the training they had previously attended (n = 28), teachers stressed the following advantages: learning and development of knowledge/skills (78,6%), reflection on teaching practice (14,3%), sharing experiences (7,1%) and the following disadvantages: little practice of training and/or a very high theoretical component (28,6%), after-work schedule (14,3%), poor preparation of the sessions (14,3%), lack of resources (7,1%) and 35,7% had pointed no disadvantage. On the last training they participated, majorly it took place in person (75%) and some already had an on-line component (25%). Was mainly in ICT (35,7%), about the specific subject teaching (28,55%) or in science education (28,55%). Still, on the last training course attended, the teachers evaluated twelve different aspects, most positively, as we can see by the analysis of Table 1. For most teachers, the training program corresponded to the initial expectations of teachers (71,4%), was very suitable to the level of knowledge of each one (60,7%), was on topics very relevant to the functions they perform (53,6%), has improved much knowledge and/or skills (53,6%), was very much in keeping with the objectives set initially (53,6%), was very important for improving skills as a teacher (53,6%), contributed more or less to improve student learning (39,3%), contributed much to improve student performance (39,3%), had a more or less adequate length (53,6%), was well oriented by the trainer (71,4%), was accompanied by very relevant documentation and of
considerable quality (39.3%) and was carried out in facilities with more or less suitable resources (35.7%).

<table>
<thead>
<tr>
<th>Did it correspond to your initial expectations?</th>
<th>1 Nothing</th>
<th>2 A little</th>
<th>3 More or less</th>
<th>4 A lot</th>
<th>5 Completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was it adequate for your actual level of knowledge?</td>
<td>7.2</td>
<td>10.7</td>
<td>71.4</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Did it cover matters relevant for your training needs?</td>
<td>10.7</td>
<td>17.9</td>
<td>60.7</td>
<td>14.3</td>
<td></td>
</tr>
<tr>
<td>Did it increase your knowledge and/or skills?</td>
<td>3.5</td>
<td>14.3</td>
<td>53.6</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td>Was it structured according to the objectives presented by the trainers at the beginning of the training program?</td>
<td>7.1</td>
<td>10.7</td>
<td>53.6</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td>Did it contribute to enhance your professional development as a teacher?</td>
<td>7.1</td>
<td>21.4</td>
<td>53.6</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Did it contribute to enhance your students’ learning performance?</td>
<td>10.7</td>
<td>39.3</td>
<td>32.1</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Did it contribute to enhance your students’ learning outcomes?</td>
<td>7.1</td>
<td>17.9</td>
<td>28.6</td>
<td>39.3</td>
<td></td>
</tr>
<tr>
<td>Was it long enough?</td>
<td>53.6</td>
<td>39.3</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was it well organised and implemented by the trainer?</td>
<td>7.2</td>
<td>10.7</td>
<td>71.4</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Was it sustained by adequate documents that had quality and that were relevant to the learning goals?</td>
<td>3.6</td>
<td>25</td>
<td>39.3</td>
<td>32.1</td>
<td></td>
</tr>
<tr>
<td>The classroom was equipped with adequate technological resources?</td>
<td>35.7</td>
<td>32.15</td>
<td>32.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 – Evaluation, in %, about twelve aspects of the last training attended

For the future continuous training (Figure 2), the majority of teachers considers to be more priority didactics of teaching and/or themes of the subject area (65%, level 5), then in ICT (55%, level 4), in the management and organization of schools and the education system (45%, level 3), in personal training, ethics or socio-cultural (35%, level 2) and last in science education (for example, curriculum and curriculum management, assessment, philosophy and history of education, special education, ...) (35%, level 1).

At a later stage, after nine months, half the teachers (n = 20) was again contacted to answer a new questionnaire on the applicability of the training in which they had participated in order to know/understand the possible changes in their teaching practices. By analysis of Figure 3,
it can be seen that over half (55%) the teachers often use ICT in the classroom, although it is a lower percentage compared with the percentage obtained before the training, and should, however, be noted that there was a small increase in the number of teachers who always use ICT in the classroom. They explained that changed school and the resource conditions of the new school don’t allow them to use ICT always. No teacher now feels that their level of competence in ICT use is bad or very bad, 85% had even considered having a good or very good level of competence in using the ICT in their teaching, showing an increase in self-esteem of teachers towards the use of educational technologies.

Figure 3 – ICT use by teachers in the classroom before and after training.

On the use of interactive whiteboards in the classroom context (Figure 4), about one-third usually use them frequently, and about a third do not usually use it, and 45% stated that there are still many classrooms that are not equipped with interactive whiteboards and 15% stated that there are several models of such equipment that difficult its use.

Figure 4 – Use of IWB by teachers in the classroom after training.

For the training on interactive whiteboards, 65% of teachers said they attended to it either by crediting or by the use of ICT, 25% attended only because of the use of ICT, in particular of Interactive Whiteboards and only 10% attended for the simple crediting, having marked some advantages: the acquisition of skills for working with interactive whiteboards (70%), improvement of skills in the use of ICT (15%) and preparation of educational materials more
motivating for students (15%), and having noted some disadvantages such as the after-work schedule (40%), none (25%), the model of the interactive whiteboard, as they had several different models (20%) and the training being too short (15%).

Finally, teachers were asked about the degree of usefulness of training in their teaching practice and it was obtained an average of 4.1 on a scale from 1 (nothing useful) to 5 (very useful). Nobody found anything useless and 75% found it useful or very useful. However, on the possible contribution of training to improve student learning, also on a scale from 1 (nothing) to 5 (completely), we obtained an average of 3.5, and 55% considered that the training contributed greatly to that improvement, 25% considered that it makes no difference, 15% that as not contributed a lot and 5% completely.

7. Conclusions
In an attempt to understand whether the training of teachers is not just an accreditation, but it becomes also an indispensable tool for professional development of teachers, allowing constant updating of knowledge and improvement of teaching and learning, two questionnaires were produced before and after training in two groups of teachers under the guidance of two different training centres. This training was more directly related to ICT, for the use of interactive whiteboards in the context of the classroom, having been regarded as useful or very useful by most respondents and was considered as a main disadvantage the after-work schedule, such as Boavida (2009, p. 107) had noted: "Continuous Education of Teachers should exist outside the after-work schedule, provided in the workspace of the teachers, or school, in the teachers' working hours, in a hour destined only to Continuous Training."

For future needs evidenced by training teachers, the majority considers as a priority the training in teaching and/or themes of the subject area and training at the level of ICT. Research shows that effective integration of ICT in the context of the classroom requires the teacher to develop TPACK, an integrated set of skills to the level of knowledge, science and educational technology. The results of our study point in this direction: for a teacher to integrate ICT in the classroom, he should have time to attend training in the use of technology, time to plan curriculum activities which integrate innovative ICT and knowledge to the level of the educational potential of technology information and communication. In this case, the use of interactive whiteboards in the classroom has increased significantly after training, showing up an effective applicability of the content addressed in training.

8. References


