Digital literacy teachers of the 2nd and 3rd cycles of Viseu (Portugal) County schools

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ABSTRACT

The main objective of this article is to understand how basic school teachers (5th to 9th grades) of the Municipality of Viseu (Portugal) carried out their training on information and communication technologies. This article is part of a larger study conducted in 2012 and 2013. To have a clear picture about the skills in information and communication technologies, we applied a questionnaire and interviews and conducted individual and focused groups using a set of selected teachers. For a longitudinal analysis of the development of these skills over time, we compared the results of this study with previous analyses, particularly with that of Jacinta Paiva, in 2002, and noticed how evolved the indicators are. We concluded that training in information and communication technologies, as a rule, does not appear in initial teacher training and is much carried out by self-training, supported by friends and colleagues and in the framework of training departments. Moreover, it was found that there was significant improvement in the number of teachers who have undergone information and communication technologies training.

KEYWORDS

teacher training; ICT skills; digital literacy; ICT.

PROFESSORES DE ALFABETIZAÇÃO DIGITAL DOS 2º E 3º CICLOS DAS ESCOLAS DO CONDADO DE VISEU (PORTUGAL)

RESUMO

Neste artigo procuramos perceber como os docentes do ensino básico (5º ao 9º ano) do Município de Viseu (Portugal) conduziram seu treinamento em tecnologias da informação e comunicação. Este artigo é parte de um estudo maior realizado em 2012 e 2013. Para termos uma ideia clara sobre habilidades em tecnologias da informação e comunicação, foram aplicados um questionário, realizadas entrevistas e conduzidos grupos individuais e de foco usando um conjunto de docentes selecionados. Para uma análise longitudinal da evolução dessas competências ao longo do tempo, fizemos a comparação dos resultados desse estudo com estudos elaborados anteriormente, particularmente com o realizado por Jacinta Paiva, em 2002, e observamos quão evoluídos são os indicadores. Concluímos que a formação em tecnologias da informação e comunicação, como regra geral, não aparece na formação inicial dos docentes e é frequentemente realizada à custa de auto-treinamento, com apoio de amigos e colegas e ainda no âmbito dos centros de formação. Por outro lado, constata-se que houve uma melhoria significativa quanto ao número de docentes submetidos a treinamento em tecnologias da informação e comunicação.

PALAVRAS-CHAVE

formação de professores; competências TIC; literacia digital; TIC.

PROFESORES DE ALFABETIZACIÓN DIGITAL DEL SEGUNDO Y TERCERO CICLOS DE LAS ESCUELAS DEL CONDADO DE VISEU (PORTUGAL)

RESUMEN

El objetivo de este artículo es entender cómo los maestros de escuelas básicas (quinto a nono grados) del Municipio de Viseu (Portugal) realizaron su capacitación en tecnologías de información y comunicación. Este artículo es parte de un estudio más amplio llevado a cabo en 2012 y 2013. Para tener una idea clara sobre las habilidades en tecnologías de información y comunicación, se aplicó un cuestionario y entrevistas y fueran conducidos grupos individuales y enfocados mediante un conjunto de profesores seleccionados. Para un análisis longitudinal del desarrollo de estas habilidades a través del tiempo, se compararon los resultados de este estudio con análisis previos, en especial con el de Jacinta Paiva, en 2002, observando cómo se evolucionaron los indicadores. Llegamos a la conclusión de que la formación en tecnologías de información y comunicación, por regla general, no aparece en la formación inicial del profesorado y frecuentemente se lleva a cabo mediante la autoformación, con el apoyo de amigos y en el marco de los departamentos de formación. Además, se encontró que hubo una mejora significativa en el número de profesores que recibieron capacitación en tecnologías de la información y la comunicación.

PALABRAS CLAVE

la formación del profesorado; las competencias en TIC; la alfabetización digital; TIC.

INTRODUCTION

Despite living in a digital era, Information and Communication Technologies (ICT) is largely used but poorly integrated in pedagogical activities. According to our findings, its application is limited, typically being used as a mere instrument for the transmission of specific content or materials and, as such, poorly focused on students and their learning process.

Even though the ICT can promote a teaching process that is adapted to the new demands of a society in transformation, it is still necessary for schools to embrace this reality, and for teachers to enhance the potential of ICT in education.

We strongly believe that schools cannot remain restricted to its walls, and that it is necessary to implement new pedagogical procedures. Policy guidelines in Portugal — defined by Resolution of the Council of Ministers 137/2007 — are clear in defending the modernization of schools via ICT integration, in order to achieve better quality of teaching and learning, thereby stating its important role as basic tools for learning and teaching in this new era (p. 6,563).

Cardoso (2002) acknowledges that in the educational system level, the resolution of any problem necessarily involves the changing of teaching methodologies. However, changing attitudes are precisely the most challenging and time consuming task to carry out and implement.

There are well-ingrained habits and deeply held beliefs that are responsible for the "resistance" observed in the use of ICT. The receptivity to innovation implies a personal effort that is related to the concept of accessibility (Cardoso, 2002). Therefore, to implement the expected changes, it is urgent to challenge teachers to reflect on their own teaching methods and, at the same time, to try and make ICT something tangible.

We believe that the use of ICT, even if it is not a miraculous potion for the construction of a new school, can push it towards a society that already dominates and uses it every day. The school, assuming its conservative role, cannot stubbornly be kept to traditional and conventional methodologies. It is necessary to face the challenge of changing where the concept of "open school" is free from restricted borders in search of the knowledge and in the construction of the knowledge.

It is therefore necessary to stress the importance of ICT in the educational context and promote its use effectively. The implementation of the Education Technology Plan (PTE) showed some segmentation within the faculty: those who feel comfortable in using learning technologies; those who do not feel very "capable", but make a more or less conventional use of ICT; and "others", who manifest themselves as completely adverse to it, refusing to implement ICT in their classrooms.

> The teachers' pedagogical orientations seem to be the factor that most influences how ICT is used in their classroom. It is also clear that the pedagogical use of ICT in teaching and learning contributes in most educational systems studied, to an approximation, in both disciplines studied (Math and Science), to the skills required by the XXI Century. (GEPE, 2008, p. 31)

We therefore believe that the teachers with instructional strategies should put themselves at another paradigm, and also acquire another role — that of knowledge manager and researcher, turning the production of knowledge into something collaborative and dynamic. It is in this context that the use of ICT should be reflected. It should be understood as a tool that contains unique characteristics, able to innovate, both in terms of teaching practices and within the organization and management of schools, as underlined by Coutinho and Alves (2010, p. 220):

> [...] In general the educational use of ICT and in particular Internet services, can act as a catalyst factor of fundamental changes in teaching and learning processes, enabling new ways of learning in different contexts of learning (real or virtual).

Innovation is not only the direction of change itself, but it is built towards a demanding society that is expecting school to train future citizens prepared for the social, technical and scientific changes. This idea was explored by Alarcão and Leitão (2006), Nóvoa (1997, 2009a, 2009b), Stoer, Stoleroff and Correia (1990), Stoer (2002) and Stoer and Magalhães (2003).

The study by the Research Office and Planning of Education in Portugal (GEPE, 2008), on the implementation of a training and certification system in ICT, points out that the integration of ICT is a key issue in day-to-day teachers, making use of a set of resources that are already available to them, together with necessary training to promote its effective use. Thus, based on the construction of a framework of skills, it is possible to establish the certification, recognition and ICT skills model of validation:

> In a context of training, assessment and certification, it makes sense to use a reference frame to the extent that certification means ensuring that the object has the quality that is expected in the context and circumstances in which it is certified. A framework is thus a reference model, either conceptually or in the operations, and assumes the triple function to anticipate the action, guide it and check the quality of the results it caused. (GEPE, 2008, p. 63)

In building its benchmark, (GEPE, 2008) alludes to the concept of digital competence, assuming the definition proposed by the European Commision (2005). It is thus defined the kind of skills that teachers should have, based on the knowledge of their practices and analysis of training and international certification models.

Digital competence involves the confident and critical use of information society technology for work, leisure and communication. ICT skills appear in the use of computers to retrieve, assess, store, produce, present and exchange information and to communicate and participate in collaborative network via the internet (European Commision, 2005, p. 18).

Due to constant stages of equipping, arising from various initiatives and especially with the PTE, the number of computers with internet access in Portugal and by level of education increased substantially — from 10,013 in 2002 to 125,188 computers in 2010. However, we continue to see low rates of use in schools, particularly in curricular integration.

The National Communications Authority (ANACOM) points out in its report (ICP-ANACOM, 2009) that an overwhelming majority of surveyed teachers already have a computer with internet connection in the household (93% owned a computer and 85% had internet access). These figures were not altered with the widely supported "e.professor" initiative, which facilitated the purchase of equipment and internet connection at subsidized prices. It also states that this initiative (e.professor) increased the use rate of computers in 35%, and 40% for the internet. All numbers point to a continuous increase of access to ICT (particularly computers with internet connection), but the reality of their effective integration in the classroom seems to not have suffered the desired changes.

From the document held by the Observatory of Education Technology Plan (OPTE) — (Lopes, 2010a), we can draw the following conclusions:

- The school makes very low use of the resource "email", both at the internal level or for external contacts (*e.g*. with parents);
- The systematic use of the computer is higher among directors in comparison to teachers, both for personal and professional aspects. For directors, the computer is seen as a professional tool, whereas the same is not true for teachers who, despite using ICT in school activities, do not explore this tool in its full potential;
- In the adult group (directors, teachers, staff and parents) there is a perception of greater proficiency in the use of computers, which may present a risk in the assessment of training needs;
- All groups indicate the major importance of ICT, particularly teachers. However, at the user level, there is no demonstration of readiness for the use of more advanced tools (production pages, blogs etc.), namely a reducing performance within the Interactive boards of teachers, even though the use rates of the remaining equipment and digital resources are very significant;
- The individuals participating in the study have access to an important set of equipment; therefore their limited use is not justified. The same report questions the distribution of equipment that follows administrative criteria and is not in agreement with the development plans of the schools, as well as the poor maintenance in the school context;
- There is now better organization of schools, flow of information, management of time and activity in the context of the classroom, greater diversity in the methods and approach strategies of the syllabus, besides the improvement in the relationship/communication between teacher and students;
- There are also positive aspects associated with greater student motivation and information/documentation of teachers. It is also noted that there continues to be an effort from families to buy computers, which have become a mandatory equipment for students, despite the existence of the "e.escola" software and the risks arising from their exposure to the Internet.

As recommended, the OPTE Report (Lopes, 2010a) highlights: teacher training; creating incentives for the use of digital learning resources; the development of a strategic plan by schools for the integration of ICT; greater emphasis on the pedagogical functions of the PTE coordinator; the creation of a scientific framework to monitor the PTE (implementation and evaluation of impact); and the creation of an instrument to assess the quality of the integration of ICT in the educational context.

We do not believe that the evolution of teaching process merely follows an intensive use of technology. It is also necessary to organize and promote "new educational experiences", in which technologies appear as mere instruments that promote collaborative/reflective learning processes and the dialogue and ongoing participation of all those involved. The learning process will be more significant as the interaction between teacher-students and student-student increases. "The development of new technologies does not diminish the role of teachers, on the contrary, they increase them and provide opportunities that should be fully exploited" (MSI, 1997, p. 46).

The teachers need to understand that technologies do not replace their activity, but can and should extend it. In this sense, we can question the pedagogical practices that exist in schools.

We should also admit the existence of a paradox — on the one hand teachers recognize the value of ICT in the development of learning autonomy, and on the other, their lack of experience and resistance become a denial for such recognition.

TEACHER TRAINING

By emphasizing the training of teachers as one of the conditioning aspects of ICT integration in teaching, we can make a brief general reflection on how immersion in the digital world occurs, both for initial or continuous training. The training of teachers throughout time has known phases and milestones that, from our perspective, created some embarrassment in the issue of ICT integration in teaching. Although the autonomy of schools and teachers has always been proclaimed, the truth is that education policies were very centralized, leading to a noticeable degradation of the teacher status.

Considering these educational policies, the following aspects are relevant:
- Perpetuation of a traditionalist education, despite European policies underlining the need for innovative and creative teaching;
- Initial and continuing training disconnected from real contexts of teaching and without the appreciation of the "personal self", or initial and continuous training without interrelationship (Nóvoa, 1997);
- Poor working conditions (mobility of teachers, high number of students per class, increased/overload of administrative work, inadequate and degraded classroom materials, loss of teacher authority, etc.);
- Successive "Education Policies" without evaluation of impact, marked by the ignorance regarding what the school is and the inherent difficulties;
- Social prestige of the teaching role in constant degradation.

The European Commission's guidelines — Schools for the XXI Century, published in 2008 — emphasize the importance of ICT in education throughout life and place the burden of responsibility in schools.

In the following year, 2009, a new training model within the PTE was launched in Portugal: "System Training and Certification in ICT Skills", resulting from the study by GEPE (2008). This model aimed at the generalization of training, the creation of a modular articulated and sequential system and the recognition of skills already acquired. It was set at three different levels of training (e-skills, educational and professional skills and advanced skills) and provided monitoring and teacher support after training.

On this issue, it is our belief that the integration of ICT necessarily involves a focused training for the real needs of teachers and schools, placed in their context of practice, which cannot dissociated from the technical aspects as well as pedagogical features, beliefs, attitudes and representations that teachers have on ICT. On the other hand, we believe that the training of teachers inserted in communities of practice (of collaborative development) can be constituted as a catalyst to break the individual logic that has been perpetuated over the years.

We are convinced that instrumental training will never be concluded, to the extent that new software and new devices are available, but it is on pedagogical training that we should focus our attention, so that the ICT integration in education could be a reality. Nor should we forget that, for all this to be successful, it is also necessary to redefine the role of teachers and their professionalism.

United Nations Educational, Scientific and Cultural Organization (UNESCO, 2013, p. 3), in the UNESCO ICT Competency Framework for Teachers, "emphasizes that it is not enough for teachers to have ICT competencies and be able to teach them to their students. Teachers need to be able to help the students become collaborative, problem solving, creative learners by using ICT; therefore, they will turn into effective citizens and members of the workforce".

The Framework is arranged in three different approaches to teaching, meaning three successive stages of teacher's development — technology literacy, knowledge deepening and knowledge creation.

> The use of new technologies in education implies new teacher roles, new pedagogies and new approaches to teacher education. The successful integration of ICT into the classroom will depend on the ability of teachers to structure the learning environment in new ways, to merge new technology with new pedagogy, to develop socially active classrooms, encouraging co-operative interaction, collaborative learning and group work. This requires a different set of classroom management skills. The teaching skills of the future will include the ability to develop innovative ways of using technology to enhance the learning environment, and to encourage technology literacy, knowledge deepening and knowledge creation. Teacher professional learning will be a crucial component of this educational improvement. However, professional learning has an impact only if it is focused on specific changes in teaching.

The Framework therefore specifies the competencies which teachers need in all aspects of their work. (UNESCO, 2013, p. 9)

Since 2008, UNESCO has been proposing guidelines for teacher's training in ICT. The framework proposes standards of skills that enhance the development of school practices that incorporate ICT as a learning element. The guidelines emphasize the development of relevant knowledge among teachers to work based on their problems and their contexts. It also insists on permeating the curriculum and having better curricula that incorporate ICT into all learning development strategies.

Costa and Peralta (2007), in a study about the skills and confidence of teachers in the use of ICT in five European countries, point out that there is great similarity between them globally: there is a positive attitude towards ICT and its potential is recognized in social and educational terms.

However, it is also possible to see the secondary importance of ICT in the educational context, to the extent that it is used as a complement to other existing strategies. For most teachers, ICT was not included in their initial training and, as such, continuing training emerges as a relevant aspect for a change in attitude and increased confidence.

As negative aspects, Costa and Peralta (2007) refer to training as being associated with the acquisition of new and difficult skills, pushing for the implementation of national programs, the emergence of new software, the organization of classroom space, technical and pedagogical support and little relevance attributed to ICT by educational authorities, particularly on the adoption of constructivist teaching methodologies.

The report on the impact of ICT in schools in Europe — by the European Schoolnet (Balanskat, Blamire and Kefala, 2006) — mentions there are remarkable differences in terms of e-maturity between countries and even within countries, referring that ICT integration in the curriculum only occurs in a small number of schools' therefore, most schools are still in a very early stage of ICT adoption.

According to Kenski (2003), the integration of ICT in the educational context requires teachers to have a wide knowledge of its potential, combining it to methodologies and teaching strategies.

Silva, Silva and Gomes (2011) indicated that in Portugal the use of ICT is reduced in the classroom by teachers, despite the strong investment in their continuous training offered by the training centers, which apparently were not the most relevant and proper action.

On the other hand, as advocated by Valente (2013), we can only speak of innovative teaching practices if educational institutions are more flexible, dynamic and articulated.

Castells (2005) postulates that technologies do not determine society, but rather the opposite occurs. Khan (2003, p. 8), in turn, refers that:

Information society is the building block for knowledge societies. Whereas I see the concept of "information society" as linked to the idea of "technological

innovation", the concept of "knowledge societies" includes a dimension of social, cultural, economical, political and institutional transformation, and a more pluralistic and developmental perspective.

The concept of knowledge society is preferable to the concept of information society, in the sense that it clearly expresses the complexity and dynamism of the changes that have been happening (Castells, 2005).

These are the new challenges that require a restructure in teacher and school models. A teacher and a school should adapt to this new society — the network society, resulting from the "interaction between the paradigm of new technology and social organization" (Castells, 2005, p. 16), *i.e.* a social structure network mediated by technologies as a way of processing and disseminating knowledge.

By agreeing with the thought of Castells (2005), we must emphasize the importance of training. We cannot forget that one must deal with the training of all citizens, but here it is about the teachers who care to think.

We do not believe in training isolated from the social, personal and professional context of teachers. The training model to be used should consider the teacher as complex and unique, but critical, reflective and a researcher of practices, in which ICT is arguably a major part of.

Therefore, training and innovation must go hand in hand as defended by Nóvoa (1991) or by Canário (2006, p. 227): "Professionals are trained in action, using problem solving strategies and a strong interaction with peers and with the addressees of educational action".

For the Organization for Economic Cooperation and Development (OECD) (2005), the teacher is a key resource in schools, and to ensure their development and competence is to ensure the quality of education, stressing that we are witnessing the non-existence of connections between the training of teachers, their professional development and the needs of school organizations.

Teachers often feel undervalued and have high rates of weariness, due to the increasing stress and workload. Thus, the OECD recommends a flexible training of teachers, capable of transforming the profession and the teaching itself.

As defended by Biesta (2012), the training of teachers needs to be developed in appropriate learning environments, providing intellectual freedom. The teacher should be able to make their choices and be self-confident.

The author refers to three training areas: qualification, to equip teachers with knowledge and skills; socialization, related to the political, cultural and social practice aspects; and subjectivity, which is related to the type of impact that training has on the teacher.

According to Canário (2006, p. 225), teacher's training in work contexts is not new and, in the last two decades, studies have allowed to clarify two facts — forms of education and training potential of work contexts, as well as the training and qualifying potential of educational organizations and professional practices.

A study by Formosinho *et al.* (2001, p. 23) states that the training of teachers has been heavily influenced by individual logic, passing over the potential of

collaborative work. This situation has, according to the authors, perpetuated the professional loneliness.

In order to prevent such a situation, it is necessary that training be as close as possible to the real teaching contexts: "blurring the separation between training as space and time of knowledge transmission, work as time and sheer scope of application of this knowledge" (Formosinho *et al.*, 2001, p. 24).

It is relevant to consider the balance between the individual experiences and the contribution it makes to the development of the professional group, as well as their institution. As defended by Perrenoud (2001) it is necessary to empower teachers to act as collective actors, an essential element for resetting their practice that we wish to be reflective and innovative.

Fullan (2005, p. 208) refers,

> We have an increasingly clear picture of the nature and importance of professional learning communities in schools. We now understand that such communities do not merely represent congeniality. Rather, they dig deeply into learning.

Fullan (2005) refers to the need of establishing learning communities that include three levels of decision, named Tri-Level Solution: the school as a community, district or region and national and regional policies. When considering these three levels of decision, it is possible to develop new skills and abilities; better resources and better targets; greater commitment, cohesion and motivation from teachers and other community members. Essentially, teachers develop new forms for the learning culture, committed to the policies and strategies at central and local level.

Thus, schools are responsible for promoting their own development based on the professional development of all constituent elements. In turn, the progress of schools lead and induce an improvement of the local communities, which will lead to the development of organizational structures at the macro level and can consistently lead to new educational policies (local and central).

This is what we believe in: progress and change that the teachers and their work do towards the promotion of innovation policies. As stated by Fullan (2005, p. 215), "Becoming more knowledgeable requires policy makers to become familiar with increasingly value and concepts of professional knowledge communities".

The teacher becomes the holder of a reflexive and critical stance focused on the knowledge existing in learning communities and requiring to be respected and to be seen, too, as a decision maker.

According to Fullan (2005), the importance of learning communities is also related to the kind of knowledge that is produced: it is a more specific knowledge and focused on the real needs of the individual and the community, and it takes place in their own working context. It is a learning process performed with others in their professional context, continuously and with ICT. As reported by Kenski (2003, p. 51):

> Learning does not have to be just a lonely process of acquiring knowledge. It can be performed in a collective and integrated fashion, connecting infor-

mation and people who are in different locations of different age, sex, physical condition, areas and different levels of training.

Lagarto (2007, p. 11-12) states that the school will have to be a place where computers gain increasing relevance, similar to that given to notebooks and books and that many teachers assume excessively magisterial teaching practices.

For all this, we believe that we can wait no longer. It is urgent to take action. The school and the teacher are an integral part of the knowledge society or the network society, and therefore they cannot be excluded.

We cannot continue to focus our discourse on the use of ICT, but in their real integration. This presupposes the knowledge of the tools that are at our disposal so we can select those that best fit our goals. As refers Kenski (2003, p. 5), "the technologies have their specificities. We need to know how to combine the teaching objectives with the technological support that best meet these objectives".

Today the training of teachers must take into account a strong ICT training, integrating operational skills and the use of conceptual skills in different contexts. If the initial training, in universities, is important, continuous training, focused on school and curricular integration, also will be. The organization of the school and the existence of communities of practice will facilitate the appropriate use of technology in support of the students' learning.

RESEARCH QUESTIONS AND METHODOLOGY

The research questions that guide us in this project are: how did teachers hold their ICT training? What kind of training sessions did they attend to? The balance they made of these training activities, as well as the areas in which they need training.

This is a descriptive study considering that its intention is to meet a given population in a given environment — a particular event. The method used was mixed (quantitative and qualitative), as it aimed at a holistic description of reality and a more objective interpretation, but also better understanding to achieve its specificities.

The techniques used were varied, which allowed the triangulation of data and to solve potential issues related to internal and external validation. The techniques are as follows:

- Survey using a questionnaire: the first is adapted from the questionnaire used by Paiva (2002), and the second part consists of the Performance Scale Educational Computer (EDIE), organized in 35 items, which can be divided in two factors: "Performance ICT" and "Management of resources and applications" (Joly and Martins, 2005);
- Semi-structured interviews (Focus Group dedicated to professors, and individual interviews addressing Coordinators of PTE Teams). For the interview, we developed a script, setting out the main issues to be addressed. Being semi-structured interviews, in addition to a pre-established order, it allowed us to make small changes and introduce other issues, whenever it felt appropriate;

- Document analysis (Educational Project and Project Curriculum of groupings).

Paiva (2002) conducted a study on the use of ICT by teachers during the school years of 2001/2002. This study had the collaboration of 19,337 teachers, corresponding to 2,499 public and private schools of all levels of education in Portugal. The data collection instrument used was a questionnaire.

The focus of our study was probabilistic, for convenience and proximity factors; size of the municipality (number of schools/teachers; features (different stages of implementation of PTE) and place of residence. As previously mentioned, our universe was the teaching population in the municipality of Viseu (district at the center of Portugal) who taught in schools from the 5th to the 9th grades.

Our data collection tools were structured as follows:

- Questionnaire: of the 648 questionnaires distributed, 147 were received, representing a response rate of 22.7%. Although the population is of 636 teachers, about 10% do not have students in the classroom, so in real terms our population was 572 teachers, therefore increasing the response rate to 26.2%;
- Interviews CEPTE: 7 of 8 CEPTE participated in our study, resulting in a ratio of 87.5%;
- Interview with teachers: 20 invitations were sent and 14 confirmations were. Of these, 3 subjects did not participate for health reasons. Of the 11 subjects 2 Focus Groups wre formed, one online, with 5 teachers, and another one in face to face with six teachers. The constitution of this sample has been guided by the principles of quality in order to be able to clearly explain the issue under revision. We have considered different variables such as age, gender, work experience and the relationship with ICT.

Through the diversity of subjects, we sought to achieve an improvement in their interactions.

Initially, the first part of the questionnaire was applied to a limited number of subjects (n = 20) to validate its content and structure. Following this initial stage, the questionnaire was applied to 139 subjects and its parametric properties were analyzed. This analysis demonstrated that this part of the questionnaire had construct validity (internal consistency and reliability) and discriminative capacity (symmetry and normal), leading us to conclude that, in general, the questionnaire had good parametric properties.

For the quantitative study we used descriptive statistics (frequencies); inferential statistics (Pearson correlation coefficient) to determine the existence of linear associations between variables and their intensity; Chi-Square, χ^2, to determine the relationship between variables and to evaluate their intensity; and the exploratory analysis, by conducting the factorial analysis of the main components, to identify response patterns and to reduce complexity, finding correlations of data between them.

In the qualitative study, we conducted a content analysis, to be able to uncover explicit meanings of the speeches. The steps were as follows:

1. Initial coding that occurred during transcription and the first reading and the initial reading that gave us greater clarity in coding — the stage of pre-analysis;
2. Exploration — we held a finer coding and decomposition or categorization;
3. Processing and interpretation.

When coding was selected, registration units per reference and object — axis themes, around which the speech was organized. Later, we held an emergent categorization (and semantic), since it has combined a priori and a posteriori categorization, following the rules of completeness, exclusivity, objectivity, appropriateness and relevance.

DATA ANALYSIS AND DISCUSSION

We found that the introduction to computers took place essentially by self-training (78.2%) and through training actions of the Ministry of Education (ME) (62.6%) (Table 1). However, there is still a significant number of individuals that held the introduction to computers through the support of a relative/friend (40.1%) and other training activities (34%). In comparison, and according to Paiva (2002), 49.2% of teachers held their introduction to computer by self-training; 38.4% had support from family/friends; 32.4% through the ME training activities; and 21.6% during graduation.

In the study by Rolo and Afonso (2006) on the educational use of the internet, 71% of the teachers had their initiation by self-training and, 67% through continuous training activities. Finally, 84% of the respondents reported that they had no curricular units in their initial training, in which internet use for educational purposes was a subject.

Also, Fernandes (2006) states that, for the subjects interviewed, self-training was the most common way to learn to work with ICT. Of the subjects who participated in its survey, 62.4% reported having done their initiation in ICT by self-training, and 74.6% by continuing education.

Table 1 – Introduction to Computers – Comparison between the authors referred to

	% Paiva (2002)	% Rolo (2006)*	% Fernandes (2006)	% Ourstudy (2013)
Self-training	49.2	71	62.4	78.2
Training actions	32.4	67	74.6	62.6
Support from family members and friends	38.4	–	–	40.1

*A study of the use of the internet.
Authors' elaboration.

As we can see, the most common way for teachers to fulfil their introduction to computer science is, in fact, by self-training (Fernandes, 2006; Paiva, 2002; Rolo and Afonso, 2006), as indicated by our teachers. However, comparing our results with those of Paiva (2002), we see that the number of teachers who reported having conducted their initiation in the computer by continuous training activities provided by the ME is significantly more expressive in the individuals of our sample, despite being slightly lower than those reported by Fernandes (2006).

For the balance of training actions attended in the last five years, in general, most individuals (51.7%) make a positive or very positive evaluation (25.2%), as shown in Table 2. However, there are still 19% of individuals who claim to not have had any training.

Between 2007 and 2012, 59.9% of respondents held general training activities and 36.1% had specific actions of the subject they teach. There are still 18.4% individuals who did not undergo any training action in this period.

In the study by Paiva (2002), 52% of the subjects had already attended computer training actions. Of these, 10.2% showed very positive results and 32.3% made a positive evaluation. The training actions attended were of general scope for 43.2%, 5.5% of the specific context of their subject area, and 3.2% in both situations.

Comparing our results to those of Paiva (2002), we can conclude that the number of individuals who reported having attended training activities (52% to 81%) and the number of specific scope of training activities of disciplines they teach (from 5.5% to 36.1%) have increased significantly.

Rolo and Afonso (2006) state that most teachers who participated in their study (65%) attended at least one course of internet training and, of these, the majority makes a positive assessment, taking into account its use in teaching and learning. Most of these actions included searching for information (29%), followed by exploring the educational software (16%) and web page design (16%). The less common was email (2%).

As negative aspects, the continuous education that does not contribute to improving the educational achievement of students was mentioned, for having no relation to the work done in the context of the classroom, as well as lack of time, lack of technological support in schools and the existence of low-skilled trainers in the training area.

In the study of Boavida (2009), the individuals mentioned that only in some subjects the use of ICT in education and training is important (70.4%), but can significantly improve the quality of their training (52.8 %).

Table 2 – Summary of the type of training activities carried out and the respective balance sheet – Comparing the results of our study with the study by Paiva (2002)

	% Paiva (2002)	% Our study (2013)
Generalist	43.2	59.9
Specific scope of the discipline	5.5	36.1
Very positive	10.2	25.2
Positive balance	32.3	51.7

Authors' elaboration.

CORRELATION ANALYSIS BETWEEN VARIABLES

- Correlation between the variable "gender" and the computer initiation variable: family support/friend, χ^2 = 4.64, p = .031.
  Most of the subjects (n = 49, 83.1%) who reported having performed their initiation in computer with the support of family and/or friends are female. However, this type of initiation corresponds only to 59 of the 147 respondents, about 40% (Table 3).
- Correlation between the variable "age" and the variable "balance of training actions", χ^2 = 29.68, p = .029 *.
  In general, most participants (n = 76, 100%) made a positive balance of the training activities in ICT conducted over the past 5 years. The individuals that contribute most to this result are in the age range between 36-45 years (n = 25, 32.9%) and 46-55 years (n = 33, 43.4%) (Table 4).
- Correlation between "scope of training activities and who did not", χ^2 = 22.96, p = .000 *.
  In general, most participants (n = 120, 100%) took training activities in ICT. These are the subjects of the age group 36-45 years (n = 43, 35.8%) and the age group 46-55 years (n = 52, 43.3%) that most contributed with this result. Only 18% of the respondents claimed to have attended no training action (27 of 147 respondents) (Table 5).
- Correlation between the variable "employment status" and the variable "computer initiation into higher education", χ^2 = 15.82, p = .000.
  The largest number of individuals (n = 21, 48.8%) that mention having started using computers during university belongs to the permanent staff of QA (teachers belonging to the staff of some schools in the same geographic area, with same board of direction). The results suggest that the number of teachers who admit having started computer literacy on their degree course is small — only 30% —, which shows the little interest caused by that this knowledge and skills to those responsible for the curricular development of courses (Table 6).

**Table 3 – Correlation between gender and
introduction to computer through family or friend**

			Initiation to computers: family support/friend	
			Not pointed	Pointed
Gender	Male	Count	29	10
		% within family support/friend	33	16.9
	Female	Count	59	49
		% within family support/friend	67	83.1
Total		Count	88	59
		% within family support/friend	100	100

Authors' elaboration.

Table 4 – Correlation between "age" and "balance of training activities"

			Training activities			
			No training	Little positive	Positive	Very positive
Age	18-25	Count	0	0	0	1
		% within Training activities	0	0	0	2.7
	26-35	Count	13	2	8	2
		% within Training activities	46.4	33.3	10.5	5.4
	36-45	Count	6	2	25	16
		% within Training activities	21.4	33.3	32.9	43.2
	46-55	Count	7	2	33	16
		% within Training activities	25	33.3	43.4	43.2
	More than 55	Count	2	0	10	2
		% within Training activities	7.1	0	13.2	5.4
Total		Count	28	6	76	37
		% within Training activities	100	100	100	100

Authors' elaboration.

Table 5 – Correlation between "scope of training actions" and "did not"

			Scope of Training Courses *vs* Did not	
			Did not pointed	Pointed
Age	18-25	Count	1	0
		% within Did not pointed	0.8	0
	26-35	Count	12	13
		% within Did not pointed	10	48.1
	36-45	Count	43	6
		% within Did not pointed	35.8	22.2
	46-55	Count	52	6
		% within Did not pointed	43.3	22.2
	More than 55	Count	12	2
		% within Did not pointed	10	7.4
Total		Count	120	27
		% within Did not pointed	100	100

Authors' elaboration.

- Correlation between "computer initiation" and "ME training activities", χ^2 = 45.01, p = .000.

The vast majority of individuals (n = 81, 87%) that mention having done his introduction to computer through the ME training activities belong to staff of QA. On the other hand, we can see that for about 63% of the teachers, the introduction to computer science was realized through training activities promoted by the ME or Teacher Training Centres, which confirms the data in Table 7.

Table 6 – Correlation between the variable "employment status" and the variable "computer initiation in higher education"

			computer initiation in higher education	
			Not pointed	Pointed
Professional status	Contract	Count	12	17
		% within higher education	11.5	39.5
	Staff of pedagogical area	Count	11	5
		% within higher education	10.6	11.6
	Staff of school grouping	Count	81	21
		% within higher education	77.9	48.8
Total		Count	104	43
		% within Did not pointed	100	100

Authors' elaboration.

Table 7 – Correlation between "computer initiation" and "ME training activities"

			"computer initiation" and "ME training activities"	
			Not pointed	Pointed
Professional status	Contract	Count	26	3
		% within ME training activities	47.3	3.3
	Staff of pedagogical area	Count	7	9
		% within ME training activities	12.7	9.8
	Staff of school grouping	Count	22	80
		% within ME training activities	40	87
Total		Count	55	92
		% within ME training activities	100	100

Authors' elaboration.

From the data presented, we can draw the following conclusions:

- most female participants reported having performed their introduction to computers by family support/friend (p = .031);
- most individuals aged between 36-45 and 46-55 years reported having conducted training sessions in ICT (p = .000 *) and made a positive evaluation of these training activities (p = .029 *);
- most participants belonging to QA mentioned having taken their introduction to computers through the ME training activities (p = .000), although they have completed their initiation to computers during their undergraduate degree (p = .000);
- most participants belonging to QA held training sessions in ICT over the last five years (p = .000), general scope (p = .020), and made a positive evaluation of these training activities (p = .000 *). They are also the QA staff who mentions to never having taken training activities in ICT within their subject of teaching (p = .000);
- most participants who performed training activities in ICT (p = .048) state to have made started their initial training in higher education;
- most participants had their computer initiation by self-training conducted in training sessions in ICT over the last five years (p = .012) and made a positive evaluation of the training actions they attended (p =.023 *);
- most participants that mention not having had their computer initiation through the support of a family/friend say they always use the computer to prepare presentations (p = .016 *), always conduct information transmission activities (p = .038), and always use computer applications in the classroom context (p = .000);
- most participants that mention having performed their computer initiation through the ME training activities attended training sessions in ICT (p = .000) and general level (p = .000); they made a positive evaluation of the training activities in ICT attended in the last five years (p =.000 *).

The study by (GEPE, 2007) pointed out the importance of continuous and progressive training plans, structured in modules of varying complexity, similar to what is done in international reference countries, such as Finland, to allow greater fitness training to the real needs of the teachers. This document also mentions, as a positive point, the training model launched in 2006 which provided the definition of several teachers' profiles and the subsequent creation of training plans for each of these profiles. However, this same document warns as to the need to continue to improve the training system and the introduction of skill certification mechanisms, referring to the case of Finland, where schools define training plans for five years, but the objectives of certification are defined centrally.

DOCUMENT ANALYSIS

The document analysis shows in some cases, such as constraints, the reduced teacher training (Curriculum and Educational Projects of the different groups in research — EP). In this sense, we wanted to find out if there were references in the documents analyzed regarding ICT in teacher training, as well as other members of the educational community.

This analysis found significant references to ICT training, both in use or within the equipment maintenance. Below, we list some phrases taken from the content analysis.

- Information and Communication Technologies [...] Training of teachers, non-teaching staff and students within this specific area (proposed to be included in the training plan [...] (grouping 005 EP);
- Promote the qualification (continuous training plans) of teachers and non-teaching staff, encouraging progression and update knowledge and skills training for the use of new working tools as determining factors for the development of a teaching quality for all students (grouping 001 EP);
- Training for the different literacies, contributing in a collaborative and coordinated manner with other teachers to develop skills that support learning (grouping 003 EP);
- Need for training of teachers and students in terms of new technologies [...] Significantly improves the skills of students and teachers in ICT; [...] (Grouping 007 EP);
- Use/mastery of new information and communication technologies (grouping 006 EP);
- [...] to develop self-training projects promoting training activities coordinated by the PTE, the VISPROF and others [...]; keep up the teaching and non-teaching staff in the technological modernization process — training and equipping; improve practices progressively with the inclusion of ICT (grouping 004 PE);
- Use and maintenance of electronic and computer equipment [...]; as result of the consultation made to the various curricular departments will be asked to Visprof training center training activities in the following areas: Interactive Whiteboards; Use of educational software; Security on the Net; Literacy Information and communication; Libraries and new digital paradigms [...] (EP grouping 003);
- Make credited ICT training for all teachers (grouping 007 EP).

When asked about the areas in which they needed more training (Table 8), teachers in our study mentioned, preferably, the Interactive White Boards (IQ) (69.4%); spreadsheet (54.4%); Web Tools 2.0 (44.9%) and educational software (36.7%). It is also important to notice that 3.4% of the subjects referred not needing any more training.

According to the study by Paiva (2002), the preferred areas were as follows: educational software (45.5%), graphics/drawing programs (39.5%), internet (36%), spreadsheet (31, 8%), multimedia/CD-ROM (25.8%). As in our study, the percentage of subjects who reported not needing training is low (2.2%).

Since the options for the subjects that require more training contained in our questionnaire were different from that of Paiva (2002), it was necessary to do a contextualization with the reality of nowadays.

We found that in similar areas there is a significant reduction in the number of subjects who seek them, as their preferences are located in other types of resources which have since been appearing and becoming more visible in terms of use in the educational context.

The study by GEPE (2007, p. 46) reports that only about 30% of Portuguese teachers attend training sessions in technology each year, despite the lack of preparation to be one of the main barriers to the use of ICT in teaching.

In European reference countries, the process of modernization has incorporated measures to increase the skills and certify agents in the use of technology, including the certification of modular program design and continuous and progressive training and the involvement of schools in defining their individual training plans.

In Portugal, it is important to accelerate the process of modernization and to this end it is important to follow equipping efforts and training efforts. Thus, it is critical to design teacher training program that includes continuous and progressive training and, at the same time, establish skill certification mechanisms. (GEPE, 2007, p. 46)

Table 8 – Subjects where teachers need more training –
Comparison of the results of our study with the study by Paiva (2002)

	% Paiva (2002)	% Our study (2013)
Word processor	18.4	6,1
Graphics programs/design	39.5	29.3
Spreadsheet	31.8	54.4
Audiovisual presentations	–	15
Multimedia/CD-ROM	25.8	20.4
Web 2.0 Tools	–	44.9
Educational software	45.5	36.7
Interactive whiteboards	–	69.4
No need for more training	2.2	3.4

Authors' elaboration.

This study also notes that the number of teachers who have been attending training sessions in technology has increased from 19%, in 2000, to 26% in 2005. However, 2002 was the year with the greatest participation, with 30%, followed by 2001 with 28%, and 2004, with 27%.

Regarding the training plan defined in each of the groups, we found that essentially their goals were to perform short sessions (between 45, 60, 90 and 120 minutes), of 60 and 90 minutes, and only the group 006 performed it for longer and credited the training (courses or workshops with a minimum of 25 hours).

These sessions were held with small groups of participants (related to existing equipment or depending on the motivation and interest of teachers) and directed to different groups of the teaching population, such as department coordinators and tutors of classes.

- We always refer to the ICT room; there are 16 machines... for 14 teachers. (CEPTE 001); [1]
- [...] open to our multipurpose room [...] (CEPTE 004);
- [...] where more than five people, five to ten people. (CEPTE 005);
- [...] on average there were 18 (CEPTE 005).

From the interviews conducted to CEPTE, we can still conclude that, in general, the training activities were mainly in Office/Open Office (Word, Excel, PowerPoint, highlighting the case of a group that held a training program in Excel — as an educational evaluation tool), Web tools 2.0 (forms, Moodle, blogs, social networks, Outlook) and Interactive Whiteboard (IW).

Other paths were still left open for the future, which relate to the latest changes that the school will suffer with the last implementation phase of PTE, such as electronic summaries, training on new software and use of Google-Scholar.

- It is essentially the online, we put people to work at home, on the Internet and with the Internet (CEPTE 001);
- IW, use of PTE equipment, projectors, computers, basic operation (CEPTE 002);
- Now for next year we have the electronic summaries... is a new step and we will see how things go [...] (CEPTE 003);
- [...] short stocks with the tools, they come up with software that will appear again [...] (CEPTE 004).

Most training actions developed by PTE teams were face to face sessions, with a basic level of difficulty from the user's perspective, except for the group 006, which held training sessions on IW, of higher level of difficulty, and the group 008, which have attended more advanced training activities on the Moodle platform.

- [...] to acquire skills on level 1, mainly from the viewpoint of the user; the other of IW is already thinking of level 2. (CEPTE 006).

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1   Local Coordinator of Educational Technology Plan — CEPTE.

In general, these actions had a practical component:
- [...] these short courses with practice, are to show how it's done, they will be taking notes... (CEPTE 004)

There is also the desire to invest in the training of students:
- Now, that things are stabilizing we have to start thinking of students, projects for students, use of media by students. (CEPTE 004)

It also made reference to the desire to carry out a training action on the "Magellan", the small Portuguese laptops, but there was no adherence by teachers:
- [...] at the time when Magellan came, we tried that people... correspond to what we needed... it was to work with Magellan in classrooms. There were some difficulties... because it's always the excuse... "Oh, we do not have Magellan, we cannot teach with the Magellan"... Nonsense, because we know that Magellan is a computer like any other, with some limitations, which is worse. (CEPTE 003)

With respect to the results of the question "subjects that require training", contained in our questionnaire, we found that most participants required IW training, belonged to QA staff (p = .028); held training sessions (p = .015); made a positive evaluation of these training activities (p = .010 *); did not attend training actions in a specific ICT discipline (p = .031) and did not use direct interaction with their students, social networks (p = .011 *) and discussion groups/collaborative work (p = .036 *).

In the study by Boavida (2009), teachers refer to future training needs, areas of specific teaching and educational technologies held in working hours and taught in school.

A study on the impact of laptops in learning (Barrios *et al.*, 2004) states that training has a direct influence on how teachers interact with their students, adding that teachers' training plans should be as close as possible to the real classroom environment, giving teachers the skills in handling software and, later, the integration of ICT in terms of curricula for each subject. It also alerts to the need of implementing collaborative working environments, addressing greater importance to peer learning.

In the opinion of CEPTE (004 and 006), there are teachers who already are building resources:
- [...] we are starting to build something (CEPTE 006);
- Gradually begins to emerge, especially those teachers who attended ICT level 2, which had training in IW (CEPTE 004).

However, CEPTE also referred that there are still some limitations from the part of teachers, who mainly deal with handling more advanced software:
- Do not use advanced software, or advanced modes [...] (CEPTE 001);
- [...] some teachers just want to use more advanced software and are not prepared for it. [...] It is already a new phase of use of new technolo-

gies that are emerging for teaching and that, despite not being trained, they want to use it because they heard a colleague (CEPTE 004);

• I think it is the use of more specific programs, one group that wants to learn [...] (CEPTE 008).

In the OPTE report, Lopes (2010b) states that one of the complaints of the students (70%) relates to the lack of preparation of teachers in the use of digital tools, and that during the interviews it is recurrent for students to refer they are often asked to solve problems when the equipment failed.

Lopes (2010b) also points out that the main disadvantage is the lack of preparation of teachers for the use of equipment that has been assigned to schools (77.3%). In this sense, most respondents indicate the need for teacher training in order to have a more effective use (76.8%).

Balanskat, Blamire and Kefala (2006) argue that the ICT skill development programs had a limited impact on teaching practices. Despite increasing the knowledge of how to use ICT in an educational context, the teachers were not able to make more efficient practices and to incorporate them in their daily work.

To these authors, teacher's confidence and, consequently, their training skills can only be improved by the incorporation of ICT in the teacher's everyday life and after a long period of time.

CONCLUSIONS

We can say that teachers in our study had their introduction to computer through self-training and ME training activities, attended training actions in general context of ICT and made a positive balance of it.

PTE teams have developed training plans that are characterized by being conducted with small groups of teachers, related to the areas of Office, but increasingly targeted for collaborative tools (Web 2.0 and IW) and with a strong practical component.

From the numbers of the training of teachers in ICT, we note that, in general, teachers held training activities in the period of 2007-2012. Although this training was of general application, the balance they do is very positive.

The majority of respondents that are in these conditions are permanent teachers of schools groupings, which seems to mean that there is some relationship between teaching stability and the attractiveness of further training.

The fact that there is greater accessibility to ICT in the classroom, which follows PTE philosophy, motivates teachers to make greater use of ICT tools, which has contributed to changes in their routines. In their words, the ICT launched them a new challenge and they are available to overcome it, despite the fears of failing.

This attitude of teachers is already identified in Costa *et al.* (2012, p. 24), who state that the motivation of teachers can determine their access to training, "showing, among other things, the acknowledgment of the value

of computers in learning and a positive outlook towards the possible impact on the academic performance of students". In fact, we found that the teachers' access to training takes place because of their desire to update and the conviction of the usefulness of ICT.

In the analysis of documents, we found concern from the management bodies of the schools regarding the training of teachers in ICT, integrated in the group training plans, in the use of ICT tools in order to improve their skills.

Lagarto (2013), quoting Venezky (2001), states that one of the supporting factors for the integration of ICT at school is leadership. In fact, the school leadership can play a facilitating role in the integration of ICT in learning processes, although references to the key factor and decisive is the teacher's belief about the effectiveness of ICT in teaching methods.

Still, the individuals participating in this study refer requiring more training essentially in IW, spreadsheet and Web 2.0 tools.

These same areas are referred by CEPTE as a future concern at the level of training of teachers.

In fact, these teachers feel the importance of digital tools and this recognition of the need for training confirms the findings by Costa *et al.* (2012, p. 24) — "it is essential to have some technical knowledge, without which it will be difficult to make a reasoned and informed decision".

In this sense, we believe it is relevant to rethink the teachers' training models in ICT, including the actions that are developed internally by PTE teams, moving in a direction of a focused training on the needs of the target subject, in communities of practice (CoP), where sharing and collaboration promote real integration of ICT in the specific context of each of the subjects.

Therefore, we must have a more targeted training for each one of the teaching contexts, focusing at the same time on the experience of each inside training group (assumption advocated by Reflective Teachers Theory and the Connectivism), and discussion-reflection and research on their practices.

It is also highlighted that the vast majority of teachers had no training in ICT in their initial graduation, which raises a basic question. How to think the curricula of future teachers without taking into account the need to deepen the digital literacy of citizens, starting with our teachers?

The teachers of our sample attended ICT training. The schools nowadays have a reasonable level of equipment, but the perception of the coordinators (CEPTE) is that most teachers are still at level 1, and should move on to higher levels of knowledge.

> At the same time we make the integration of technology in schools, it is necessary to invest in teacher training so that they can explore the facilities offered by Digital ICT, changing their practice and not simply using them to strengthen the information transmission process. (Valente, 2013, p. 130)

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