Using ICT to promote teachers' competences: strategies and challenges

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Abstract

When merged with new pedagogical practices the use of open social web tools as a means to mediate and support teacher training triggers a whole new set of implications for education and individuals. It is important for teachers, learners and other educational agents to think of themselves as co-learners in a social collective aware of their role in developing the skills and knowledge they need to function in today's world. In this paper we present partial data from a case study conducted to analyse the contribution of social web tools for knowledge construction in a post-graduation course. We describe the context of the study and the methodology adopted, followed by a description and discussion of the results. Data used for the purpose of this paper were collected through a questionnaire and a focus group, and results presented relate to the development of relevant competences and attitudes for teaching practice. Results suggest that the use of social web tools can contribute to the creation of personalized learning environments, in which the development of skills related to the social, technological and professional spheres can be supported. Although results cannot be generalized, the paper adds insights into the teacher training panorama and draws possible future directions for work in the area.

1. Introduction

Teachers are greatly responsible for engaging students in learning so that they develop the skills and knowledge they need to function in today's world. Questions on how they can instil the skills and the values students need to experience success in the present and in the future or on how they can provide opportunities for students to move beyond being passive recipients of knowledge to become knowledge builders, capable of creative and innovative solutions to problems are just examples of teacher's concerns.

Teaching has become more challenging with the rapid expansion of knowledge and the daily development of new technologies, and as new concepts of working and learning evolve, teachers are required to develop and apply new visions and practices that can facilitate learning and make it more meaningful.

Since the implementation of the Bologna Declaration, the European Space for Higher Education (ESHE) has placed a strong emphasis on the initial and continuous education of teachers by suggesting the integration of Communication Technologies (CT) in their training programmes as well as the adoption of flexible and open paradigms in order to achieve higher rates of quality, efficiency and equity under a lifelong perspective [1-3]. As a result, there has been a substantial increase in the use of CT for the exploration of professional training, which has been boosted by the evolution of the Internet and its web based services and tools to enable the distribution and interconnection of contexts, networks, content or people [4, 5]. Since then, research in the field has also increased and results achieved suggest that the use of CT can actually have a relevant impact on learning, on competence enhancement or knowledge construction [5-7].

The Bologna process introduced heavy legislation in the Portuguese educational system policies causing profound changes and adjustments in educational organisation, teaching reforms and class teaching conditions. Also, cuts on university and

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research funding have obliged Portuguese Higher Education Institutions (HEI) to restructure their organizational and funding models. The turmoil caused by the combination of all these aspects deferred (and still is) effective changes to take place at the desired pace. Nevertheless and despite this, we find evidence of good practices resulting from experiments conducted at some HEI, which show that efforts towards new directions in teacher education are being made and signs of change also exist.

Recent research demonstrates that teachers, usually in the form of individual initiatives, are stepping beyond pervasive practices and bureaucracies and are starting to explore the potential of CT and experimenting with the social web and the tools it provides to promote new forms of initial and in-service teacher education with the aim of improving professional competences and practices. At the same time, they are providing in-practice examples of the benefits that user-centred approaches and applications can have in the support of personalised and lifelong learning.

The present work provides data on such an example. It takes the stance that the use of social web tools as a means to distribute an open and flexible learning environment has a relevant impact in the way teachers envision professional education and learning. It also establishes that the use of these tools may result in the creation of personal learning spaces, in which the development of social, technological and professional related competences may be harnessed.

It is structured as follows: after the introduction, we briefly describe the affordances brought about by social software to teacher training. At this point we refer to personal learning environments (PLE) as a means for teachers to support their social, technological and professional growth and learning. Afterwards, we present the context of the study that laid the basis for the present work, followed by a description of the methodology used. We then present and discuss the findings achieved and conclude with some final remarks.

2. Social software for teacher training

The social web, as we know it today, relies heavily on user-generated content, communities, networking and social interaction. It offers innumerable free-easy-to-use tools and applications that give users a high level of control to sort, manage, use and recreate knowledge in many different ways and for many different purposes. The great force beyond the surface of the social web is not solely driven by tools and services; rather, it is driven by people's attitudes towards wanting to know, participate and engage in sharing, creating and interacting.

Research about the use of social web tools – such as blogs, wikis, social bookmarking, networking platforms and so on – as a way to mediate instruction and promote distributed learning environments concludes that it fosters the creation of learning communities and networks and the emergence of collective learning experiences; this, in turn, leads to the development of new skills, attitudes and competences [8-11]. It also refers that they give users the control to explore different paths, connect to others and learn through the exploration of knowledge areas, on the basis of individual choices. Following the idea recently expressed by Burns [12], competence development falls within the domain of knowledge, especially one that involves the deepening of processes, procedures and strategies in performing specific tasks. When teachers work within the communities or networks which are akin to their practices, the process of 'influencing' their thinking is facilitated [13], for they are prompted to engage, interact and participate and, at the same time, they are faced with the need to meet the expected competences required to actively participate and interact in the communities themselves.

The challenges and possibilities brought into play by the social web give users the freedom and ability to adopt tools and applications and use them as organised personal spaces in which they can work, learn, reflect and collaborate with others. Such tendency has been placing renewed emphasis on the term PLE, which is described as "a single user's system that provides access to a variety of learning resources, and that may provide access to [other] learners and teachers" [14].

The primary affordance of this system is, according to several authors [14-17], the enhancement of individual learner control and the control of time, place and learning pace. A PLE should be based on a set of tools to allow personal access to resources from multiple sources, and to support communication and knowledge creation. A PLE, as Siemens [18] suggests, apart from being "a collection of tools, brought together under the conceptual notion of openness, interoperability, and learner control (…) [should be] comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts". PLEs enable users not only to select and organise their

tools, but also their sources, learning contexts and communities. Users customise them according to their individual tastes and needs. This is what makes PLEs distinctive from each other, as individuals also differ from each other.

PLEs are characterised by possessing common features that allow users the degree of control and 'individuality' mentioned below [15–19]:

- Aggregation and publication – A PLE enables users to manage the tools, networks, content and websites that make up one's web interactions without the need to visit or log in to multiple sites. Users can aggregate content from RSS feeds, which allows them to filter and manage information according to their interests. Almost anything can be syndicated: blog posts and comments, social bookmarks, videos, podcasts, photos, news, etc. Additionally, users are allowed to customise the layout, appearance and privacy level of their personalised environment. It also enables users to publish their own content and that of others, share it, remix it and recreate it.
- Openness and flexibility – The PLE is not a static closed space. It works as an open and extensible one that offers users the possibility to add or mash up third party services into their personal spaces. Furthermore, it allows the integration of both formal and informal learning contexts, sharing information and engaging in the process of knowledge creation. Sharing, collaborating, asking, clarifying, supporting and challenging points of view are key aspects in the process of learning.
- Management – Users are active in managing information and responsible for driving their learning processes as well as setting their learning goals. By adopting this stance, users become empowered to reflect upon learning paths and outcomes. As such, awareness of one's needs and the paths to meet them become a key issue in facing learning and training as an ever-evolving activity.
- Lifelong learning support – PLEs can grow and evolve according to the needs of their users. The challenges posed by a multi-task oriented and change-driven society demand a constant update of knowledge and skills and can facilitate information flow across institutions.

The proposed model altered the assumptions usually associated with the traditional teacher model, which portrays teachers as isolated nodes, who interact unilaterally with curricula documents, popular media and basic print and digital resources. This teacher does not use mediums or tools that are relevant to how students learn today and disregard the reality that they can learn anything, anywhere and anytime. The networked teacher is someone that has moved from being a passive consumer of information to be critically attentive in a world where information is everywhere. He or she uses and experiments new sets of tools to help engage students and make their learning more relevant and meaningful. Networked teachers are lifelong learners, who explore, engage and define their own learning. They accompany societal changes and embrace technology as an opportunity, not a threat. They grow along with students and develop their own skills by exploring technologies available and blending them with pedagogical strategies.

In sum, networked teachers are able to build connections with other people and peers online, not only to develop their own learning, but also to interact, collaborate and find support from them. At the same time, they are able to update channels of communication with their students and interact with them in renewed ways.

These assumptions were taken into account during the design and implementation of our course. One of its main objectives was to provide student-teachers with a training environment that, apart from helping them enhance their professional skills and knowledge, could serve as a new teacher model to help them leverage the current reality of education. Student-teachers were encouraged to explore and use different tools to build their own networks and to customize their personal learning environments, so that training and knowledge advancement continued after the course.

3. Context of the study

The case study was conducted in the context of a first year course subject which was part of a Master's Degree on Multimedia in Education offered to students under a b-learning regime at the University of Aveiro, Portugal. The course combined two face-to-face (f2f) sessions and distance work for the span of four weeks. The course organisation was as follows.

In this course, students, mainly in-service teachers, were expected to: (a) deepen their knowledge about cognitive systems and learning theories related to the process of knowledge construction; (b) explore the potential of social

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networking tools to augment interaction and (c) conceive a plan for the collaborative development of interaction and implement it as an in-class activity. Along with the aforementioned objectives, the course aimed at developing competences related to students' professional activities: (a) the integration of CT into teaching practices, with strong emphasis placed on social web tools; (b) the development of collaborative work; and (c) the development of research, management and information organisation skills.

By the time MCA started students were already comfortable in the use of social web tools since these had been introduced and adopted right from the beginning of the master's course. At that time, students – divided in ten groups of 5–6 members each – were encouraged to create their group blogs (*WordPress*) to share and discuss their projects, and to save and share any information they deemed pertinent resorting to a social bookmarking site (*Ma.gnolia*). They were also challenged to write their progress and final reports collaboratively using a wiki and to adopt *Netvibes* or *Pageflakes* as an aggregation platform to help them follow and manage all course activities. In sum, students were encouraged to create their own learning environment, in which they could organise activities and information and in which they were allowed to add third party services pertinent to their interests (subject and non-subject related) throughout the whole course, a strategy difficult to implement with blackboard, the institutional platform.

The majority of students felt relatively at ease in setting up and managing their learning spaces and working collaboratively online when MCA started. Also, being aware of this, the teachers responsible for the course challenged them to use their knowledge of social web tools and collaborative practices to develop and implement an in-class activity that promoted interaction in their teaching practices. Students were free to explore and adopt whichever tools and methods they felt were convenient for their project work and to implement it for the span of one week.

The great challenge of UC was undoubtedly lead students, while teachers in this case, implementing a curriculum or non-curriculum didactic proposal for involvement of their students in activities, using CT, to promote interaction. Each group elected a given discipline, and taking into account their level of education, the teaching contents and their recipients, identified using CT and based its integration, methods of operation and use. Ten plans that were implemented in the various stages of education, from

the 1st cycle of basic education up to secondary school, some of them showing interaction between different levels of education and different schools were developed. Activities included, for example, the creation of an online radio for two different classes of secondary schools to address issues such as Liberty, Contemporary Society and the Revolutions; creating a mashup of blogs to present and discuss the curriculum theme Anthropic Occupation with three classes of Biology and Geology of Secondary Education; creating a blog and a wiki to address the issue of Symmetries Math program or operation of gaming to work curricula of History and English, and non-curricular Citizenship.

4. Methodology

We adopted the case study methodology to allow greater insight into the process and practices that the students were engaged in and to provide an analysis of the students' experiences. Drawing on the characteristics of a case study a range of research techniques were used (Yin, 1994), overarching both quantitative and qualitative methods: (a) direct observation, (b) content analysis from online interactions, (c) analysis of the participation dynamics, (d) survey questionnaire and (e) individual and focus group interviews. Data gathered and presented in this paper refer to the analysis of specific items surveyed with the questionnaire and the content analysis of data collected from a focus group. It also refers to two distinct moments of our study. The application of the questionnaire occurred four months after the course took place and the focus group was conducted one year later. This was done to allow students the time and necessary distance to reflect upon (and draw possible conclusions about) the MCA experience and also to enable us to collect data on these aspects over differing periods of time (short- and long-term).

5. Findings and discussion

From the 56 students enrolled in MAC, 42 (75%) answered the questionnaire. Thirty nine were teachers and only one was not working at the time the questionnaire was submitted. As mentioned earlier, by the time MCA started, most students felt confident in using social web tools and used them on a regular basis. 50% of the students stated that they used such tools very often, 24% always, 24% sometimes and only 2% referred their rare use. Most of the students, 95%, considered the course

instructional design as very good and 5% thought the choice was reasonable. The most pointed reason for the enrolment in the course was the personal desire to learn more, followed by a personal interest and the professional prospects it could imply.

One of the questionnaire objectives was to find whether students had felt to have developed certain competences or attitudes. Items exploring these aspects were based on the competences referred to by the Framework for 21st Century Learning, namely (i) creativity and innovation; (ii) critical thinking and problem solving; (iii) communication and collaboration; (iv) information, (v) media and (vi) ICT literacy. As such, students were presented a set of statements addressing three different areas: social, teaching and technology. We then asked them to position themselves as to whether they felt they had Developed (D), Not Developed (ND) or had No Opinion (NO) about the statements. We also gave them the chance to add or refer other competences and attitudes that we did not mention in the proposed statements and that they felt to have developed (Other).

In all areas the total percentage of students choosing option D exceeded 80% (Fig. 1). The development of social competences was referred by 85% of the students, the development of technological competences by 81% and the development of professional competences was recognised by 90% of the students.
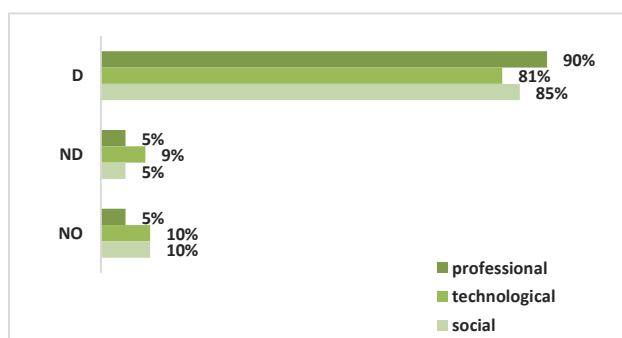

Figure 1. Percentage of responses regarding the social, technological and professional areas.

The total number of students choosing the ND option had little expression: 5% in the social and professional area and 9% in the technological one. Also, the number of students opting for NO was relatively similar with 5% in the professional area and 10% in the remaining areas.

In what the social area is concerned (Figure 2) the percentage of students positioning themselves in option D is over 85% in all statements but one. An "active and responsible participation in civic life" was considered to have been developed by 48% of the students, whereas 17% referred not having developed it and 35% opted for a neutral answer. Results are, nevertheless, interesting in what relates with the contribution that the use and immersion in online social contexts may have for the development of civic literacy as referred to in the Framework for the 21st Century Learning, namely at the level of being informed, engaged in debates and making decisions based on evidence or exercise one's civic rights and duties under a reflected and participatory form.

Both the development of the "ability to work in group" and "the ability to recognise diversity as collective intelligence" were mentioned by 93% of the students. These aspects were also mentioned during the focus group, in which one of the participating students referred the ability to work with different people with diverse academic backgrounds as one of the greatest assets of the whole course, which enabled the possibility to take advantage of each person's singularity.
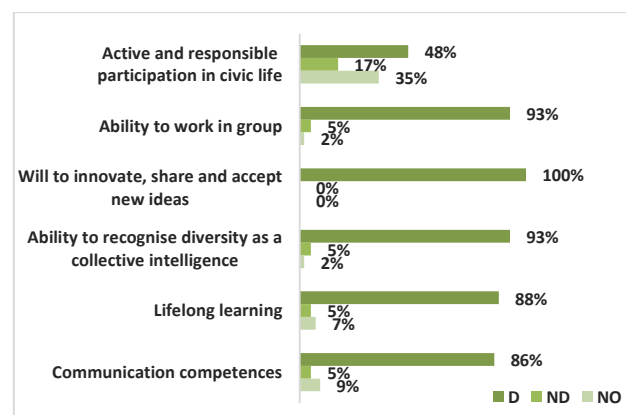

Figure 2. Percentage of answers regarding the social area.

He stated that "(…) another positive aspect is that we learn that by working together we can create a synergy that we cannot achieve alone" and that it is possible to "solve different problems in very different contexts using each person's knowledge." Both statements were also pointed by the same percentage of students in the other options: 5% chose "ND" and 2% "NO". In our view "the ability to recognise diversity as a collective intelligence" is

related with the last statement as we sense that the cultural, ethnic and geographical diversity, the curiosity to participate in multicultural exchanges and contexts, is linked with the principles of citizenship.

Most students, 88%, admitted to have developed "lifelong learning". The use of CT as a vehicle to promote autonomous learning under a lifelong perspective was mentioned several times by different students during the course discussions, not only because they consider that "the knowledge cycle is shorter", but also because it is urgent "to renew knowledge and prepare future citizens for a renewed world". The number of students opting for the ND option corresponds to 5% and to the NO option to 7%.

Almost the same percentage of students, 86%, referred to have developed "communication competences" and, again, the percentage of answers in the other options in these later statements is relatively inexpressive – 5% (ND), 7% and 9% (ND) respectively.

Within the professional area (Figure 3), results show the topics dealt with and the projects carried out during the course helped students develop and improve their competences and professional attitudes. The percentage of students choosing option D exceeds 90% in all statements but two. In fact, these two statements – 'interdisciplinary attitude' and 'sharing, promoting and transferring good practices among professionals' – reached 83%. We risk arguing that this 'lower' result may still reflect the working and teaching habits that are pervasive in Portuguese schools. We feel collaborative work and sharing philosophies are still in their infancy among most Portuguese teachers and interdisciplinary attitudes are finding it hard to make their way into the schools due to curricular organisation. Such assumption is reinforced by data retrieved from the focus group conducted, which suggests that "(…) teachers also have a responsibility, but most of them are not willing to promote the use of ICT in their schools for various reasons, such as lack of sharing habits, lack of knowledge in using ICT and lack of motivation to learn." Nevertheless, the number of students having referred to have developed "collaborative and participatory practices among working peers" corresponds to 38 (1%), which may indicate signs of change, at least on the part of these students.
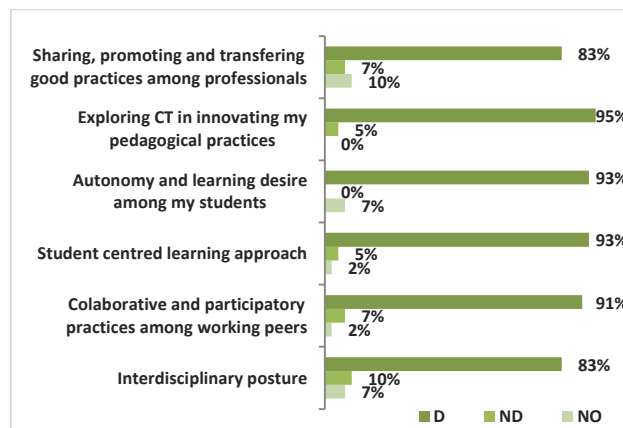

Figure 3. Percentage of answers regarding the professional area.

From the 42 students, 39 (93%) admitted to have developed a "Student centred learning approach" and "Autonomy and learning desire among my students". A total of 3 students opted for the ND and NO. This number may be related with the fact that 3 students were not teachers. However, this fact did not reflect itself in the results obtained regarding the "Exploring CT in innovating my pedagogical practices", in which 40 students (95%) chose the option D. The fact that most of the statements presented to students were related with the teaching activity may have prevented some of them to express their opinion about the development of professional competences, but not about their perception of the web's potential to promote the innovation of teaching practices.

Data triangulation regarding these students let us assume that the use of CT contributed for the development of competences related to their professional activity. For instances, one of these students stated that he created a professional Skype address, which is available at his personal website and which customers may use to contact him. He also mentioned the use of podcasts to explain the type of services he executes. During the focus group, another student referred that the course "gave [him] a whole new perspective about the way [he] can work and nowadays [he] totally depend[s] on CT to perform his tasks."

Within the technological area (Figure 4) results also prove satisfying. Around 95% of the students referred to have developed the ability to manage resources and tools for specific professional tasks. Nearly 86% referred to have developed the ability to reflect upon the societal consequences of

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technology, leading us to interpret they realise the need for education to accompany the changes society has undergone (and is undergoing), since this was one of the matters explored in the course. With the same percentage they also stated to have developed the skills to manage multimedia communication and analyse information. 81% developed competences related to information processing.
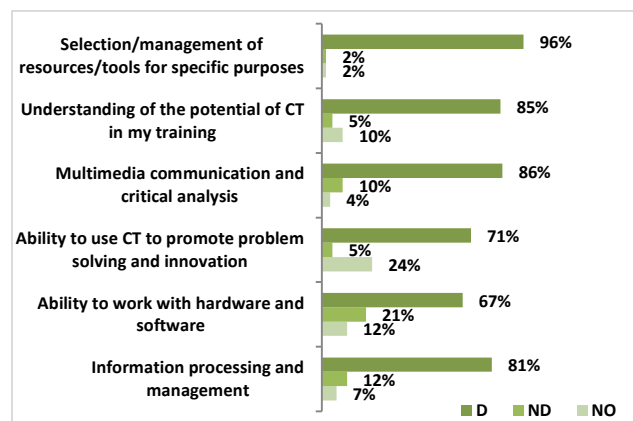

Figure 4. Percentage of answers regarding the technological area.

The lowest percentages were found in the 'ability to present technological solutions for the resolution of professional and social problems' and 'software and hardware management'.

Reflecting back on the skills proposed, for instance, by UNESCO – which were published after MCA occurred – we can recognise some of them as having been promoted and developed during the course. UNESCO proposed that teachers should be able to identify and use different hardware and software technologies and discuss corresponding social strategies for their instructional use. According to the UNESCO guidelines, it is desirable that, apart from knowing how to use common hardware, teachers should know how to use a variety of software packages, not only appropriate to their subject matter area, but also to promote collaborative work, knowledge creation, social interaction and to support students' learning.

Students were required to do this during MCA. When preparing their projects, they shared ideas, discussed what software was adequate to the in-class activity they were preparing and applied it to its design and instruction. Surprisingly, only 66.7% of the students stated to have developed skills in managing software and hardware, 21.4% stated not having an opinion and almost 12% referred not

having developed this skill at all. Although the course required students to use social software such as blogs, wikis and other productivity and communication tools, we believe students may have felt they had already developed such skills during the earlier stages of the course.

The 'ability to present technological solutions for the resolution of professional and social problems' is somehow related to the previous statement. We believe that, indirectly, students developed this skill by engaging in social interaction with each other and with other participants, reflecting about the importance of supporting teaching professionals and promoting innovation in schools. In this way, not only were they able to present technological solutions for the improvement of their profession, but they were also able to promote and engage in discussions and activities that resulted in high levels of interaction and social participation.

These beliefs and conclusions are supported by the data gathered from the focus group interview. Information resulting from content analysis is in line with the results obtained from the questionnaire. One year later, all participants agreed that the course had given them the opportunity to explore and test the use of CT with their students. One of the teachers stated she "would never had had the self-confidence and courage to experiment and explore CT in her teaching were it not for the 'know-how' gained and developed during the course". Another one said that though he had been experimenting with CT tools some time before the course, it helped him realise the open and participatory architecture underlying the social web and its potential for education. His practices started to include the integration of social web tools to develop collaborative work among his students and to explore them as a more informal setting for different approaches to learning.

Most participants also mentioned that the fact of having to work at a distance made them more able to organise and manage specific tasks and to look for who and what interests them. Another aspect mentioned was that the use of CT to work or share information with their peers has a positive effect because it encourages them to learn and become part of the community. Nevertheless, teachers, in general, agreed that it takes a lot of effort to read, discuss, experiment and test out ideas in their classrooms and with peers. They believe the integration of CT is a process that needs to be woven into the daily activity of teachers, but due to several reasons it is hard to arrange time and space to accomplish this.

Most teachers are unanimous in reporting different constraints that make it difficult for

effective changes to occur, both at institutional and individual levels. The 'excess of subject matter in school', 'extensive curricular programmes', 'work overload' and 'delays in the implementation of the TPE' are some of the obstacles that are acknowledged by teachers and that they feel they are faced with in their schools. One of the interviewees, responsible for the CT Competences education programme in his school, states that schools are now preparing to enter the second stage of the programme. However, 'there are still many in-service teachers who did not get any training yet. In fact, some teachers' knowledge of CT is not sufficient enough to place them in the first stage'. Additionally, 'teachers' attitudes towards CT and change through practice are not always the most positive ones'.

Changing attitudes and changing practices need time and, although we cannot generalise results, we feel that a hands-on experience such as the one provided by the MCA course can leverage the process of change and renewal. It was effective in accomplishing its overall intended goal by enabling teachers to learn how to take advantage of the different learning opportunities social web tools provide and to adopt them for both personal and professional purposes.

6. Conclusion

The present paper provides an opportunity to account for important developments that are being put into practice in the education of teachers in Portugal. Despite the socioeconomic factors and policies that characterise the present state of education in the country, efforts are being made to empower teachers to face the challenges posed by a highly technology driven society.

Findings seem to suggest that, when merged with new pedagogies and innovative methods – transfer of responsibility to students, autonomous learning, context situated problem based learning, collaborative work – social web tools can support distributed learning contexts in which the development of different competences are fostered. Additionally, they can be explored to promote personal learning spaces in which teachers can find support for continuous education and learning.

In this particular case, the use of social web tools contributed to the development of a PLE used by teachers to support the development of social, technological and professional skills and attitudes. The development of practical activities throughout

the course "forced" them to learn by doing, by experimenting, exploring and integrating CT into their pedagogical practices. For instances, regarding the social area, we can point the development of civic and citizenship attitudes, especially the ability to accept diversity and difference as an asset for the development of collaborative work. Within a technological perspective, it is possible to point out, among others, the development of skills at the processing, management and manipulation of information level, tools and services. Alongside these skills comes the ability to manage effectively this same information, tools and services for personal and professional purposes. Within the professional area, it is possible to identify the development of the ability to exploit the potential of the social web for innovating practices, as well as for widening and customizing communication channels with students and colleagues.

To be able to realise the benefits afforded by social technologies in teacher education, the starting point is changes in pedagogy. The challenge resides in introducing new technologies that reflect the new pedagogical principles that guide current educational models. And in times of rapid change, HEI responsible for the education of teachers need to provide them with adequate education settings and with the necessary knowledge and competences that effectively promote and develop CT integration in their profession, going beyond the actions traditionally associated with teaching and learning.

Nevertheless and despite the appetite for different educational uses that the social web has been offering, further reflection and discussion about such affordances are needed as well as an evaluation capable of accounting for the outcomes that result from its use in teacher training. Dissemination and sharing of good practices is important to understand what, despite adversities, is being done to move ahead in teacher education.

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