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285 - Educating Teachers in ICT: from Web 2.0 to Mobile Learning

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Abstract: This paper focuses and reflects on ICT programs for teachers in pre-service and in service enrolled in Master Courses at the University of Minho. We briefly present its evolution starting from the nineties. We propose five topics, beginning with a contextual understanding of learning in the 21st century, evaluation of online resources, creating educational resources such as Treasure Hunt and WebQuest to take advantage of the information available online, publishing and interacting using Web 2.0, and mobile learning. A study aimed at Master students from Educational Technology was conducted and inquired as to their Web literacy as well as their reception to mobile learning in schools.

Keywords – ICT, Web 2.0, Mobile Learning, Teachers training

This paper focuses on ICT programs for teachers in service and in Master Courses at the University of Minho. One of our concerns is related to ICT skills and competencies to be acquired by teachers in order to motivate their students, the Net generation, as Don Tapscott calls them, or the “thumb” generation (Rheingold, 2002). They must be familiar with the use of Web resources and Web 2.0 tools. More recently, mobile learning is an emergent concept that results from e-learning technical evolution. The teachers must be familiar with and know how to create interactive activities for mobile devices as students have several mobile devices they can use to learn anywhere at any time.

The UNESCO’s project “ICT Competency Standards for Teachers” declares that schools and classrooms “must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills” (UNESCO, 2008, p. 1). The Portuguese government has shown concern in up to date school equipment, teachers and students laptops through several initiatives such as “e-school “(e-Escola), “e-little school” (e-escolinha) with the laptop Magellan, and “e-school 2.0”. Teachers training in school centers or in Higher Education must prepare teachers to be active and skilled in integrating ICT in their teaching contexts. We believe, as Richardson (2006) also pointed out, that if we want to have teachers to teach Web 2.0 technologies effectively, they must learn to use them effectively.

ICT PROGRAMS FOR TEACHERS

We briefly describe the evolution of the ICT programs which intends to integrate technological evolution. It has also a duration constraint. Before Bologna, our undergraduate students had two semesters of Educational Technology, a full year course integrated in a five year teaching program. With Bologna, we only have Master students that are enrolled in one semester only.

In the nineties, we started with Web 1.0, evaluation of the information online and the construction of Websites using FrontPage. They learned how to publish a website in a public and free server. This was very useful for them as they were able to create a website to support the resources for their students and the activities they would like to carry out online.

Later on, we introduced WebQuest, created by Bernie Dodge and Tom March in 1995, and the Treasure Hunt, as two modes of guiding students through selected websites (Carvalho, 2003).

With the appearance of Web 2.0, we introduced blogs and social networks such as Hi5, Facebook and LinkedIn (Carvalho, 2006). Afterwards, we gave importance to podcasts, starting with audio podcasts, enhanced podcasts, vodcasts, and screencasts (Carvalho, 2010, Carvalho & Aguiar, 2010, Carvalho et al., 2009). Now, we feel it is time to introduce mobile learning in ICT programs.

Mobile learning is a natural consequence of the emergence of a new global digital communication society which enables new forms of learning to occur in different contexts (Sharples et al., 2009). Moreover, we realized that students in schools do not bring their laptops to class because they are heavy (Moura & Carvalho, 2008; Certal & Carvalho, 2011). However, they bring their mobile phone, their MP3/MP4 player,

or their Sony PSP. Teachers must learn how to create resources that can be accessed by their students' mobile devices.

We think that five main topics must be focused on when it comes to ICT programs: i) learning in the 21st century, as the contextual framework for all other topics; ii) evaluation of online information; iii) creating resources that foster web exploration, such as Treasure Hunt and WebQuest; iv) publishing and interacting in Web 2.0, such as through Google Sites, Podcasts, and social networks; and v) mobile learning. These five topics will enable the teacher to be updated and capable of teaching his/her students using ICT.

LEARNING IN THE 21ST CENTURY

For centuries, being literate has been defined as being able to read and to write. Although those core abilities are crucial in learning, they are no longer enough to ensure understanding (Richardson, 2006). Consumers of Web content need to be editors as well as readers. Anyone with access to Internet can publish without any prior review. This requires that teachers teach their students to become increasingly active consumers of that information instead of just accepting it as legitimate.

In order to truly take advantage of the power of the read/write Web, we must be literate in the sense of publishing (Richardson, 2006). We must be able to work with others in virtual environments. Writing is no more limited to text in a multimedia society. It is possible to combine many forms of writing into a process of rip, mix and learn. Siemens & Tittenberger (2009) refer that our learning and information acquisition is a mashup. Knowledge is a function of connections and understanding is the emergent shape of the network (idem).

We must know how to manage the information we consume. Web 2.0 can support these literacies (Richardson, 2006). The classroom of the Read/Write Web is of collaborative and individualized learning as well as of active participation of class members. The classroom is characterized by the continuous process of creating and sharing content. By inviting students to become active participants in the design of their own learning, we teach them how to be active participants in their lives and future careers (Richardson, 2006).

Teachers must start to see themselves as connectors, not only of content but of people (Richardson, 2006). They also need to collaborate with their students as well as with each other. They must begin to see themselves more as learners alongside their students. They need to think themselves as coaches who model the skills that students need in order to be successful and motivate them to strive for excellence.

Siemens (2005) stresses that "our ability to learn what we need for tomorrow is more important than what we know today". The author reports a vital skill: the ability to plug into sources in order to meet the requirements of new knowledge. Learning is the process of creating networks (Siemens, 2006). Connectivism is driven by the understanding that decisions are based on rapidly altering foundations. The idea of connectivism in learning is very interesting and pertinent however, we do not consider it a learning theory as the author refers. The increased complexity of our world does not permit any one individual an accurate understanding of the entire scope of a situation, field, or subject. We rely on connected specialization – where we increase our competence by adding specialized functionality to our network (Siemens, 2006).

EVALUATION OF ONLINE INFORMATION

As everyone can publish online, it is important to remember students that evaluating online information is necessary. Criteria for evaluating information online are presented, based in Alexander & Tate (1999), Schrock (2002), Richmond (2003), Treadwell (2006), and Jonassen (2007). The Web becomes a source of content for teaching and learning. Concepts such as quoting and plagiarism are focused, as well as standards for writing references.

After this important step a new one emerges: the construction of activities based on the information online such as Treasure Hunt and WebQuest.

CREATING RESOURCES THAT FOSTER WEB EXPLORATION

Usually we introduce Treasure Hunt and WebQuest. We prefer to start exploring the Treasure Hunt, followed by its creation. It is simpler than WebQuest and is very useful for guiding students to learn about a topic.

Students learn the importance of the Introduction to motivate the target audience. The sequence of questions regarding the topic with web links, and finally how the students will submit their work (table 1), for example, sending it by email to their teacher.

Table 1: Structure of a Treasure Hunt

Treasure Hunt	Description
Title	Target audience The author's name Author's e-mail
Introduction	To motivate the students about the topic.
Questions	Under each question, the Web links to find the information.
Last remark	To inform the students how to submit their work

In my classes, I suggest that my students post their Treasure Hunt in their blog or in another Web 2.0 tools, such as Issuu. This way, they can create a Treasure Hunt easily.

Afterwards, students are invited to analyze a WebQuest using a grid. The students learn a lot when they have to create a challenging WebQuest. It is very demanding and time consuming because everything is explicit especially all steps of the Process, and in the Evaluation with the self and peer evaluation grids.

A WebQuest contains five components: Introduction, Task or Tasks, Process, Evaluation, and Conclusion (Dodge, 1999a).

Table 2: Structure of a WebQuest

WebQuest	Description
Title	Target audience The author's name Author's e-mail
Introduction	To motivate the students about the topic.
Task (s)	The task is the single most important part of a WebQuest. A well designed task is doable and engaging, and elicits thinking in learners that goes beyond rote comprehension. Dodge (1999b) creates a WebQuest taskonomy, i. e., a taxonomy of tasks.
Process	Describes all steps to achieve the task or tasks.
Evaluation	Indicates how the product and the students will be evaluated. Questionnaires and grids help this evaluation for self and peers evaluation.
Conclusion	Presents what the students gain in solving the WebQuest and a new challenge is proposed: a new website, a new question, a game, ...

According to Dodge (2007) a real WebQuest has the following attributes:

- "is wrapped around a doable and interesting task that is ideally a scaled down version of things that adults do as citizens or workers;
- requires higher level thinking, not simply summarizing. This includes synthesis, analysis, problem-solving, creativity and judgment;
- makes good use of the web. A WebQuest that isn't based on real resources from the web is probably just a traditional lesson in disguise. (Of course, books and other media can be used within a WebQuest, but if the web isn't at the heart of the lesson, it's not a WebQuest);
- isn't a research report or a step-by-step science or math procedure. Having learners simply distilling web sites and making a presentation about them isn't enough;
- isn't just a series of web-based experiences. Having learners go look at this page, then go play this game, then go here and turn your name into hieroglyphs doesn't require higher level thinking skills and so, by definition, isn't a WebQuest."

Students were required to check the WebQuest developed in the WebQuest evaluation rubric (Bellofatto et al., 2001) and the Fine Points Checklist. With our experience, we realized that teachers with several years of teaching experience understand better what to write on each WebQuest component, however, they tend to propose a task similar to what they teach. It takes time to understand the idea of a challenging task. The younger teachers or those with no teaching experience have difficulties in developing the Process and the Evaluation (Carvalho, 2003; 2006) and thus, particular guidance is needed.

PUBLISHING AND INTERACTING ON THE WEB 2.0

The appearance of Web 2.0, an expression proposed by Tim O'Reilly (2005), changed the way we can publish and connect people and ideas. The Web 2.0 tools are easy to use because they are user friendly.

Publishing online became as simple as writing on a word processor. The RSS feeds allow the user to subscribe and to automatically receive information regarding new posts in blogs, journals news, Flickr images, podcasts or other new materials.

The Web 2.0 enables social networks such as Facebook, LinkedIn, MySpace, Orkut, hi5 (Bacon, 2009). There are a myriad of tools. The most commonly used are blogs, wikis, podcasts, Flickr, YouTube, Delicious, Google Docs, Google Sites. Now we focus on blog, Google Sites and podcasts.

A blog is useful as a first tool to post small messages, linking to thematic websites or events, to videos for example on YouTube, to images, to synthesize readings, etc. It is used as an e-portfolio (Carvalho, 2006).

Google Sites is used to create students' websites. For example, to create a personal website or a website to support activities, such as WebQuest, exercises and links regarding a subject.

Podcasts are also very useful. We start with audio podcasts, using the Audacity software, the students learn to upload the mp3 files to MyPodcast (Carvalho et al., 2009). Then, they also learn to create enhanced podcasts. It combines images, text and voice as an automatic presentation slide, and a screen cast in Jing software. Vodcasts can be created with MovieMaker. All these podcasts can be uploaded by students to their portable devices thus allowing them to learn whenever they wish, even when on the move.

MOBILE LEARNING

There are conceptualizations of mobile education that define it in terms of its technologies, its devices and its hardware (Kukulka-Hulme & Traxler, 2007; Moura, 2010). Such a definition is technocentric. Winters (2006) identified four perspectives on mobile learning:

- the *technocentric* – this perspective is dominant in literature. It is viewed as learning using a mobile device;
- *relationship to e-learning* – this perspective considers mobile learning as an extension of e-learning;
- *augmenting formal education* - the perspective that regards the place of mobile learning in relation to all forms of traditional learning, not only classroom;
- the *learner-centered* perspective emphasizes the mobility of the learner. “Learning that happens when the learner is not at a fixed, predetermined location, or (...) when the learner takes advantage of learning opportunities offered by mobile technologies” (O'Malley et al., 2003 apud Winters, 2006, p. 6) . Traxler (2007) considers that m-learning integrates any and all the features presented by Winters (2006).

More recently, the authors emphasize the process in m-learning. Sharples et al. (2009) characterized mobile learning as the processes (personal and public) of coming to know through exploration and conversation across multiple contexts, amongst people and interactive technologies. Pachler et al. (2010) described that “mobile learning is not about delivering content to mobile devices but, instead, about the processes of coming to know and being able to operate successfully in, and across, new and ever changing contexts and learning spaces” (p. 6). The definition proposed by Mobile Learning Network about m-learning focuses on “**the exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning**” (MoLeNet, 2011). Mobile learning can occur in any location, at any time, and in transit.

Mobile learning can be seen in terms of the learners' experiences with an emphasis on device ownership, informality, movement and context that will always be inaccessible to conventional e-learning (Kukulka-Hulme & Traxler, 2007). It increases learning flexibility for students.

Kukulka-Hulme & Traxler (2007) refer the work of Naismith et al. (2004) who have demonstrated that mobile technologies can relate to six different types of learning:

- behaviourist-type - the quick feedback or reinforcement element is facilitated by mobile devices;
- constructivist – immersive experience are provided by mobile investigations or games;
- situated, learners can take a mobile device out into an authentic context, or use it to access information while moving around an environment in a specially equipped location such as a museum;
- collaborative, mobile devices provide a handy additional means of communication and a portable means of electronic information sharing;
- informal and lifelong learning, mobile devices accompany users in their everyday experiences and become a convenient source of information or means of communication that assist with learning, or records it on the go for future consultation;

- Support, or coordination of learning and resources – activities that teachers and learners engage in at various times during the day.

Tasks suited to mobile learning involve data collection, tests and quizzes, consolidation of learning, personal reflection and skills acquisition (Kukulka-Hulme & Traxler, 2007).

“Whether they are welcome right now or not, mobile devices are finding their way into classrooms in children’s pockets, and we must ensure that educational practice can include these technologies in productive ways” (Naismith et al., 2004, p. 36).

Our students must learn how to use software in order to create interactive activities and websites to be accessed using their mobile devices.

MASTER STUDENTS’ WEB 2.0 PRACTICES AND REACTIONS TO MOBILE LEARNING

In January 2011, we inquired Educational Technology Master Students as to their presence online using Blog, Twitter, Facebook, etc; what kind of Web activities they use with their students, what kind of mobile devices they have, if they would like to learn to create interactive activities for mobile devices and if they think that mobile learning will be the future in schools. The questionnaire was completed during a face to face session. During this academic year we are not teaching.

Sample characterization

Seventeen students answered the questionnaire: 10 females and 7 males. Their age ranged from 23 to 50 or more years (table 3). The mode is the range 30 to 39 years with 9 respondents.

Table 3: Sample age (n=17)

Age range of respondents	f
23-29	3
30-39	9
40-49	2
≥50	3

It is possible to identify two groups in what concerns teaching experience, the first one with 9 respondents with 4 to 7 years teaching experience and the second one with 8 respondents with 14 to 34 years of teaching experience (table 4).

Table 4: Years of teaching experience (n=17)

Years of teaching experience	f
3	3
4	1
5	2
6	2
7	1
14	2
15	1
18	1
23	1
29	2
34	1

These students have a different teaching background. Five of them teach ICT and other subjects such as Computer Science (4), Visual and Technological Education (2), Sciences (2), Portuguese (1), Musical Education (1), Plastic Expression (1), Mathematics (1), Geography (1), Biology and Geology (1), Geometries (1), Pharmacology (1) and Pharmacotherapy (1). All students possess Internet connections.

Students' participation in Web 2.0

All students have a blog (table 5), but it was mandatory for one of the Master courses. All of them except one, are members of a social network, such as Facebook (13), hi5 (2), and MySpace (1). The e-learning platform is used by 13 respondents to support their classes. Twitter is used by 4 students, and 2 have a website.

Table 5: Students' presence online

Students participation on the Web	f	%
Blog	17	100
Twitter	4	24
Website	2	12
Facebook	13	76
Another social network	3	18
e-learning Platform	13	76

In their classrooms, 16 respondents use tools to publish students' work online (table 6). Unfortunately, all other resources and tools are rarely used. They use interactive exercises (14), WebQuests (11), and only a few use vodcast (3) or send SMS to students (5).

Table 6: Resources and tools used by Master Students in their classrooms

Frequency	Frequently f	Rarely f	No f	I do not know it f
In the classroom they use ...				
Treasure Hunt	0	1	14	1
WebQuest	2	9	5	0
Interactive exercises (HotPotatoes or another)	6	8	3	0
Podcast	0	6	11	0
Vodcast	1	2	12	2
Screencast	0	3	13	1
Tools to publish works online	11	5	1	0
Send SMS to students	1	4	12	0

Most respondents do not use Treasure Hunt (14), Screencast (13), Vodcast (12), Podcast (11), nor do they send their students SMS (12). Two respondents did not know what a vodcast was, and one indicated screencast and another Treasure hunt.

Most respondents (13) mentioned that they have activities online for their students (table 7). Two referred that they do not have time to do so. One indicated that she would like to but she does not know how, and another said that her students do not have access to the Internet.

Table 7: Carrying out online activities

Activities online for your students	f	%
Yes	13	76
I do not have time	2	18
I would like to, but I do not know how to do	1	6
Other	1	6

Those who answered that they have online activities for their students indicated HotPotatoes or other interactive exercises (4), exercises in the LMS (3), Exercises in Google Docs, searching online, posts in blogs, challenges but it was not indicated what kind, and activities sent by e-mail. This list was a little bit disappointing.

Portable devices

They were asked about their portable devices (table 8). All of them have a laptop and a cell phone. Most of them have MP3 players (10). The MP4 player and the PSP is only owned by 5 respondents.

Table 8: Students ownership of mobile devices

Ownership of mobile devices	f	%
Laptop	17	100
MP3 Player	10	59
MP4 Player	5	29
PSP (PlayStation Portable)	5	29
Cell phone	17	100
Another mobile device	4	24

Four students indicated another mobile device such as GPS, digital audio recorder, PDA, iPad, and iPhone. They use their cell phones for calling (15), sending and receiving SMS (14), alarm clock (15), calendar (3), taking photos (1) and two to access the Internet daily (table 9). Seven do not use their cell phones to access Internet and eight do so but not often. Twelve respondents have Internet access as they reported.

Table 9: Uses of their cell phone

Cell phone is used for ...	Daily	Weekly	Rarely	Do Not use
Send and receive SMS	14	2	1	0
Send and receive MMS	0	2	9	6
Calling	16	1	0	0
Alarm	15	0	2	0
Playing games	0	2	7	8
Calculator	0	5	8	4
Calendar	3	7	3	4
Listening music	0	4	7	6
Taking photos	1	4	11	1
Making movies	0	1	11	5
Internet access	2	2	6	7

They seldom take photos (15), use the calculator (13), make movies (12), listening to music (11), sending and receiving MMS, calendar (10), and they play games (9). Six respondents have free SMS.

The students were asked if they would like to receive on their cell phone: a paper to read, reminders of due dates or class alterations. All of them were receptive to class alterations, 14 to reminders of due dates, and 9 to receiving a paper to read. Only 3 students had used the cell phone to study.

They were asked if they would like to learn how to elaborate interactive activities or interactive exercises for mobile devices. The majority of students (71%) would like to learn to elaborate interactive activities or interactive exercises to mobile devices, but 29% indicated that they could not identify any relevance in learning that (table 10). No one knows how to do so.

Table 10: Learn to do interactive activities to mobile devices

Would you like to learn to do interactive activities or exercises for mobile devices?	f	%
Yes, I would like	12	71
No, there is no relevance in knowing that	5	29
I know how to do it	0	0

Reactions to mobile learning

They were asked if they think that mobile learning will be available in schools. More than half of the students (53%) considered that mobile learning will be available at school soon (table 11). One student did not answer.

Table 11: Mobile learning available in schools

Years of teaching experience	Number of teachers		Yes, mobile learning will be available in schools		No, m-learning will not be available in schools	
	f	%	f	%	f	%
3 to 7	9	53	3	18	6	35
14 to 29	7	41	6	35	1	6
34	1	6	-	-	-	-

Master students with more years of teaching experience (from 14 to 29 years) are all receptive to mobile learning except one. The majority of younger master students are not so receptive to the technical evolution of learning in schools. This result was not expected. We expected younger teachers to be more receptive to mobile learning than older ones.

CONCLUSION

We propose five topics in educating teachers in ICT. All of them are related and contributed to an increasingly skilled teacher for the 21st century. We start with a framework regarding learning in the 21st century, focusing on the evolution of the concept of being literate; the teacher as a students' guide supported by Web 2.0 tools; and the relevance of connectivism. Then, the evaluation of the information online and the concepts of quoting and of plagiarism will be addressed. This topic will be followed by the analysis and creation of a Treasure Hunt and/or a WebQuest that foster web exploration. The fourth topic pertains to publishing and interacting using Web 2.0 tools, such as Google Sites, Podcasts, and social networks. Finally, we focus on mobile learning and its importance nowadays.

An inquiry was conducted to the Educational Technology Master students about their presence online, what kind of Web activities they used with their students, their opinion regarding the future of mobile learning in school, if they would like to learn how to create interactive activities for mobile devices, and what kind of mobile devices they possess. All of them with the exception of one belong to a social network. In what concerns the use of resources and web 2.0 tools in the classroom, they use them, but most of them rarely. The majority of respondents (76%) have activities online for their students, but we expected more interactive activities. They have mobile devices, but only 53% believe in mobile learning in school. They are also receptive in learning how to create interactive activities or exercises to mobile learning (71%). These respondents must learn about interactive activities based on online resources to use them in the classrooms frequently.

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