The use of internet tools for teaching and learning by in-service biology teachers: A survey in Brazil

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HIGHLIGHTS

- A survey on the use of the internet by Brazilian biology teachers.
- Brazilian biology teachers spontaneously use the internet to improve teaching.
- Brazilian biology teachers use the internet essentially in a distributive way.

ARTICLE INFO

ABSTRACT

The study investigated the profile of use of internet tools by in-service biology teachers in the State of Rio de Janeiro. We identified four purposes of use: Study, Didactic, Professional Management and Personal Socialization. The pedagogical use internet tools proved to be small. It was mostly focused to the search for information about biological contents for individual use and to the download of materials to distribute to the students. We discussed the importance of articulating policies and programs of teacher education through the development of activities to raise awareness about the pedagogical potential of collaborative internet tools among Brazilian teachers.

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1. Introduction

The understanding of society as a network is the result of the widespread use of computers and the new technological paradigm characterized by the high speed at which information is generated, processed and shared (Castells & Cardoso, 2005).

The internet tools allow the access, processing and production of information available in text format, image, sound, data, multimedia and hypermedia documents, constituting an essential language of communication in contemporary society (Lévy, 2001).

International institutions like the British Educational Communications and Technology Agency (BECTA, 2003), the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2005, 2008) and the World Bank (World Bank, 2005) have advised and promoted the use of Information and Communication Technology (ICT) for teaching and learning. Asian and European countries have implemented public policies aimed at increasing and improving the use of ICT in their educational systems (Law, Lee, & Chan, 2010; Usun, 2009). Such policies involve providing high speed access to the internet, acquisition of hardware and other digital resources, as well as providing technical and pedagogical support to schools, including opportunities of the so called teachers' "professional development" (Plomp, Anderson, Law, & Quale, 2003, 2009).

In Brazil, official documents have reflected the importance of using ICT in education. Resolution CNE/CP No. 1/2002 of the National Council of Education suggests that qualifying for the teaching activity should include the use of information and communication technologies (Conselho Nacional de Educação, 2002). Recently, the

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National Conference on Education emphasized the importance of ICT in the educational context, as well as the effect of a policy of Teacher Education Program for the use of technology by in-services teachers (Conferência Nacional de Educação, 2010).

Brazilian science and technology policies for digital inclusion are being implemented by means of providing low cost access to high speed internet and the distribution of personal computers to both teachers and students (Brasil, 2012). Although such initiatives are not yet homogenous throughout the country, recent actions include substantial funding for providing internet access and computers to all Brazilian schools in a relatively short term (FNDE, 2010). Part-nerships between higher education institutions and schools aimed at improving basic education have also been developed at smaller scales (Fidalgo-Neto et al., 2009).

1.1. Potential use of ICT in teaching and learning processes

The use of the internet and ICT in education has been the subject of research, both in relation to students' learning as well as to teachers' pedagogical practices. New technologies can be used to support and foster learning to create situations based on real-world problems brought to the classroom as well as to create opportunities for feedback and reflection, construction of learning communities and expansion of learning opportunities for teachers (Bransford, Brown, & Cocking, 2000). Literature review showed that the use of ICT in teaching has also a strong motivational effect on students (Balanskat, Blamire, & Kefala, 2006; Lee et al., 2011). According to Osborne and Hennessy (2003), the use of ICT in science classes benefit students in developing their critical thinking skills, handling and collection of data as well as by increasing their access to knowledge presented in a visual format, raising motivation and engagement.

The successful integration of ICT in schools' classrooms has been suggested to depend on the ability of teachers to structure learning environments which incorporate the ICT in their teaching of specific contents rather than as an additional isolated content to be taught (Mishra & Koehler, 2006; UNESCO, 2008; World Bank, 2005). Several studies have reported the impact of ICT use in teaching while other have focused on understanding how teachers are coping with these tools in their practice (Law, Pelgrum, & Plomp, 2008; Law et al., 2010; Martinovic & Zhang, 2012; Plomp, Pelgrum, & Law, 2007). The results of many of those studies show that despite the increase in ICT usage in education, the teachers seldom use the ICT in ways that positively impact their education contexts (Dawson, 2008; Hinostroza, Labbé, Brun, & Matamala, 2011; Plomp et al., 2007). Indeed, reports from several countries suggest that ICT use by teachers, if present, is frequently limited to the preparation of texts for classes and for personal communication by email, and not for teaching science, where research suggests more benefits for learning (Dawson, 2008; Gray, Thomas, & Lewis, 2010). In fact, the use of ICT in schools is influenced by many mutually intertwined factors such as teachers' knowledge and abilities in ICT usage, national curricula and infra-structure, among many others (Plomp et al., 2007).

1.2. Possibilities of internet use in the teaching learning processes

The evolution of the internet from a model known as the Web 1.0 (distributive) to the Web 2.0 (collaborative) has allowed to expand the use of its pedagogical possibilities. Web 1.0 is charac-terized by a division of roles between producers and final infor-mation users (consumers) by the centralized production of content, static websites and mainly by a one-way distribution of knowledge by downloading (Oreilly, 2007). Oreilly also states that, the concept of Web 2.0 was created to define a new kind of experience of internet use, which redefines the role of the Web as a platform, in which the use of tools with a greater interactivity potential creates

a network effect by participation and collaboration among users. In that way, its main features offer the possibility of authorship, in-formation sharing and collective building of knowledge: users can continually remix data from multiple sources, whilst providing their own data and services, allowing these to be remixed and edited by others and so forth.

The popularization of the internet and advances in technology have enabled the emergence of new digital tools and actions related, which in turn, have the potential to be used for educational purposes (Martin et al., 2011). These tools available on the internet have received different names in the current available literature, Web 2.0 technologies (Franklin & Harmelen, 2007), social web (Boulos & Wheeler, 2007), internet tools (Chen, 2008), social media (Dabner, 2012) Web 2.0 tools (Laru, Näykki, & Järvelä, 2012), digital technologies (Brito, 2012) among others. Armstrong and Franklin (2008) describe the following as examples of important and com-mon Web 2.0 technologies: blogs, wikis, social bookmarking, media sharing spaces, RSS feeds, collaborative editing tools, micro-blogging and social networking sites. However, traditional tools of the internet such as emails, chats and search websites remain widely used up to date (Pew Internet & American Life Project, 2008), providing a mix of possible actions on the web. Thus, users have at their disposal a number of tools to perform specific actions such as doing research using search websites (e.g. Google, Ask, Bing); communicate via synchronous and asynchronous tools (e.g. Gmail, MSN, Skype), file sharing (e.g. YouTube, Flickr), write and publish online diaries (Wordpress, Blogger, Twitter) and social networking (Facebook, MySpace, Second Life).

In Brazil, the pedagogical use of internet has grown exponen-tially over the last decade (INEP-MEC, 2010). That increase is largely consequent of the use of internet tools for distance education (DE) both in undergraduate and graduate courses. From 2007 to 2011, the Ministry of Education (MEC) has invested an amount of funds of R$ 1.5 billion (about U$ 750 millions) in the distance education system in Brazil (Clímaco, 2011). The percentage of students enrolled in DE undergraduate programs has increased from 0.2% in 2001 to 14.1% of total Brazilian undergraduate students in 2009 (about 800,000 students) (MEC, 2010). In addition, improving teachers' teaching abilities is considered a key factor for over-coming Brazil's serious educational problems (OECD, 2010). It is reasonable to consider that such a widespread stimulus for the use of internet tools for teacher training should preceded by studies on teachers' preparedness and interest for the use these tools in sci-ence classes. However, very little is known about the pedagogical use of internet by Brazilian teachers and reports on its pedagogical use for teaching in Brazil are scarce, along with studies that focus on computer use and search on the internet. Martinho and Pombo (2009) carried out a study in science teaching with students of the 7th grade of basic education, identifying an increase of 10% in test scores among students who were taught using projection pictures in power point, viewing educational videos and internet search. The findings also indicated that 92% of the students were positively influenced when they made use of such strategies for learning. The students reported that these strategies improved their concentration and increased their enthusiasm to learn.

On the other hand, in relation to teachers' training, an isolated report has pointed out that Chemistry teachers who attended a continuing education course presented serious limitations with the use of ICT, and that, even having access to computers at home and also to computer labs in their schools they still do not make use of ICT in their classrooms (Aires & Lambach, 2010).

The paucity of information on internet use by Brazilian teachers makes it necessary to further characterize such use in order to offer support to the several teacher training initiatives already in course in that country. The present study aimed to identify the profile of