Proceedings of the
SPDECE-2012. Ninth multidisciplinary symposium on the design and evaluation of digital content for education

13–15 June 2011
Universidad de Alicante
Alicante, Spain

Edited by
Manuel Marco Such
Pedro Pernías Peco
Abstract

Learners and teachers use different tools to carry out the learning activities. These instruments evolve and change, what means that learning activities are being influenced depending of the context that surrounds the educational processes. The Information and Communication Technologies application to teaching and learning processes implies a revolution regarding to the way learning and teaching is performed. However this model did not provide as many advantages as it were supposed to and a new change is necessary. Against this background rise web 2.0 tools and tendencies, which is another evolution on the way learners and teachers interact but those tools should be incorporated and adapted to the existing systems. This is not an easy task and means to take into account the users, the tools, the interoperability between learning tools, etc.

Along this paper the problem of how to integrate 2.0 tools into institutional learning system is explored, specially focused on how through PLE and by using interoperability solutions it is possible to take advantage of 2.0 tools in learning and teaching processes. It is proposed a simply way to integrate such tools with the existing systems and an experience that demonstrate how to apply it. This experience is based on the use of twitter in a classroom. From that experience can be shown that the integration of 2.0 tools is not complex and improves students’ participation and motivation, which could have associated a learning improvement.

Keywords: Learning Management Systems; Web 2.0; Interoperability; Learning Tools; Personal Learning Environments
1. Introduction

Along the time, the tools learners’ and teachers’ employ to learn, have changed linked to the context in which the learning process takes place. Not so long ago the instruments used were books, paper, blackboard and so on. Now the context has changed, although most of those tools are still used, the Information and Communication Technologies (ICT) provide “new” (and not always better) tools for learners and teachers. Such tools are continuously evolving, passing from the application of the Personal Computers, the Internet and the use of Learning Management Systems (LMS) to other open and flexible environments that are able to include 2.0 tools, social networks and facilitates users’ learning in other contexts (mobile devices, digital TV, game consoles and so on). Those tools influence the way in which learning and teaching is carried out.

Taking into account these tools evolution, the application of ICT was important, because it provides new ways to support learning processes, based on the use of the Internet and computers, however it has not the expected success (Mott & Wiley, 2009; Trucano, 2005). This is mainly because: 1) Institutional resistance to change regarding the introduction of certain technologies in formal environments (Mott & Wiley, 2009; Piscitelli, Adaime, & Binder, 2010). 2) The insistence on the technology application when it is not required or seen as a solution (Chadwick, 2001). 3) The need for digital literacy amongst teachers and students, many of whom are digital immigrants and the younger pupil generations are digital natives (Bennett, Maton, & Kervin, 2008; Prensky, 2001b) implies a confrontation and a gap that makes it difficult that they can take advantage of new technologies. 4) The lack of connection between the formal, non-formal and informal environments makes difficult to improve learning processes and the centralization of the activity in only one context. 5) Moreover, lot of technological applications and tools are defined without taking into account the final user, which means that adopting and using them can be difficult.

In order to address these problems, learning institutions need to change their strategies. They must provide environments more adapted to the student and open to include the new set of Web 2.0 tools that are under the student’s control. The rationale for the shift of this ‘locus of control’ is that personalization can improve learning by empowering the student to manage their learning at their own pace (Attwell, 2007) with their own technology within the context of the activities of their daily lives which are also managed by the same technologies.

The most important element in this new paradigm is the user and she participates in learning process as a “prosumer”, that is to say, not only a consumer of learning contents but also a producer (Schaffert & Hilzensauer, 2008). She uses a “new” set of tools that complements the institutional learning environments, these tools are the 2.0 tools. Such tools, linked to the web 2.0 concept, rise as a new way to use the Web, supported by a set of technological applications oriented to collaboration between users (Segaran, 2008).

The integration of the Web 2.0 in learning processes requires to define new communication styles, new roles, new learning scenarios and wide set of new learning activities, that is to say, new learning challenges (SCOPEO, 2009). Throughout the use of 2.0 tools learners begin to participate actively in classes using very different kind of tools or devices. eLearning 2.0 begins (Downes, 2005).

Learning by using 2.0 tools has an enormous potential, as evidenced by experiences such as those carried out by Jekins (Jenkins, 2006) or Downes (Downes, 2005), and is increasingly expanding in different areas of education [15]. However, despite all this potential, is necessary take into account several problems that have appeared during the use of these tools: 1) Improvisation in the use of 2.0 tools and the personalization of learning can lead to the wrong idea that learning should not be planned. Is necessary to estimate, validate and evaluate the use of 2.0 tools in learning activities (Suárez, 2008); 2) The possibility that students do not create products and prefer to copy and learn by using very specific media (BECTA,
2008); 3) Lack of support to 2.0 tools by Learning Management Systems (LMS). 4) The inclusion of 2.0 tools in learning processes makes bigger the gap between digital natives and immigrants (Bennett et al., 2008; Prensky, 2001a, 2001b).

In order to solve these problems new learning environments are defined. Spaces in which 2.0 can be applied, where the learner was the center of learning processes and all kind of learning activities can be included. These spaces are the PLEs (Personal Learning Environment). PLEs facilitate the user’s learning by allowing them to use those tools they want to use and not joining them to an specific institutional context or learning period (Adell & Castañeda, 2010) such as the traditional LMS does. A PLE should be understood as a concept, not a thing. As Wilson has remarked "The PLE is not a piece of software. It is an environment where people, tools, communities and resources interact in a flexible way" (S. Wilson et al., 2007).

However, the introduction of a PLE does not suppose the demise of the LMS (Adell & Castañeda, 2010). LMS have been highly successful in stimulating online engagement by teachers and learners and also they are widespread and big amounts of money have been invested on them (Sclater, 2008). The likely coexistence of LMSs and PLEs introduces a requirement for interoperation between the two. But, how is possible to achieve this interoperation in order to enrich LMS with personal learning tools? And how to apply it to real subject necessities?

During the paper these questions are addressed. In it is described how to facilitate interoperability between these two environments, and propose an easy way to implement it. That implementation is test in a real experience and some results about the improve provided by learning activities based on 2.0. tools is defined. The following section describes how to implement the PLE and how to connect it to the LMS. After that, an experience of the application of one of those personal tools to supplement a Computer Science subject is commented. Finally some conclusions are posed.

2. The 2.0 Tools, PLEs and Computer Science Education

2.1. Opportunities provided by PLEs and 2.0 Tools

In the previous section 2.0 tools have been introduced as a way to improve how students learn. Every day it becomes more essential adapt learning to trends related to Web 2.0. Education must be supplemented by new applications, tools and paradigms, leading to what has been called eLearning 2.0 (Ajjan & Hartshorne, 2008). This trend in learning requires tools that facilitate: 1) changes in the interaction between socializing the learning (Downes, 2005); 2) the specific features of new learning actors, i.e. natives and digitals immigrants (Bennett et al., 2008; Prensky, 2001a); 3) support for educational trends related to the Bologna process such as lifelong learning or informal learning, student mobility and so on (Chen, 2003); 4) student-centred learning (Attwell, 2007).

The Personal Learning Environment (PLE) has been proposed as a way to satisfy these requirements and to integrate such 2.0 tools. It is a relatively recent concept which emerged around 2001 (Brown, 2010) although it did not become widespread until November 2004 when the term appeared as one of the sessions of the JISC / CETIS Conference of that year.

From that date on there have been many contributions from different authors regarding the definition of a PLE. This is not an easy matter and still the debate continues. The definition of the PLE is not the aim of this paper so that issue is not explored more deeply. Just to complete the previous definition of the PLE one more provided by Attwell is considered: "Personalized Learning Environment is not an application but a new approach to the use of new technologies in learning. There are still many unresolved elements. But in the end the discussion about the use of PLE is not technical but philosophical, ethical and educational. The PLEs provide students their own space to develop and share
their ideas, through learning environments that connect resources and contexts so far apart” (Attwell, 2007).

So, as previously commented, on one hand there is an institutional space represented by the LMS that provides a controlled space to learn and, on the other, the PLE, which includes the tools the student really use to learn and not only those provided by such environment. In order to take advantage of the facilities that the personal tools give to the student it is necessary to integrate or at least communicate the LMS and the personal environment.

In order to do this there exist several initiatives. Wilson and others classified them in three possible ways of integration (Scott Wilson, Sharples, & Griffiths, 2008):

- Opening the LMS through the inclusion of web services and interoperability initiatives. This integration trend includes: iGoogle based initiatives (Casquero, Portillo, Ovelar, Romo, & Benito, 2008), social networks connected with LMS (Torres, Edirisingha, & Mobbs, 2008), the LMS that offer support for implementations of interoperability specifications (IMS, 2011), PLE with specific communication protocols (van Harmelen, 2006) or integration based on service-oriented architectures - SOA (Peret, Leroy, & Leprêtre, 2010). Main difficulties of these initiatives are: the institutional barriers to the opening of formal environments and the fact that those initiatives are focused on information exportation and not on interaction exchange. That is to say, communication is oriented in one direction, from the LMS towards the external tools; basically exchanging information about what happens on the platform and providing no information or interaction back to the LMS.

- Integration of external tools into the LMS. In these initiatives user might not decide which tools she is going to use and they will be limited to institutional decisions. Some initiatives that can be included this group are: LMS defined for the integration of external tools (Booth & Clark, 2009), Google Wave Gadgets integrated into Moodle (Scott Wilson, Sharples, Griffiths, & Popat, 2009), PLE introducing tools based on log analysis (Verpoorten, Glahn, Kravcik, Ternier, & Specht, 2009), initiatives based on tools integration driven by learning design activities (de-la-Fuente-Valentin, Leony, Fardo, & Kloos, 2008), integration architectures (Alario-Hoyos & Wilson, 2010), etc. These initiatives have several problems such as: integration problems between tools, context integration difficulties, stiffness for customization by the student and so on. Those that best overcome these problems are the ones that define a learning platform starting from scratch or from a previous institutional development. This will greatly limit the scope of use of the solution that will be applied to very specific context.

2.2. Integration of PLEs an institutional learning systems

Given the above described context, it is clear that the integration between the PLE and LMS is not an easy task because, among other things: 1) LMSs do not usually include interoperability standards (Selater, 2008). 2) The integration of training activities in the PLE is not satisfactory because they are designed for representation, classification and tracking in other platforms (Palmér, Sire, Bogdanov, Gillet, & Wild, 2009). 3) Problems of traceability of user activity in the PLE and, therefore, also in the formal environment (Põldoja & Laanpere, 2009). 4) Single-sign-on implementation problems (Severance, Hardin, & Whyte, 2008). 5) Information security problems (Casquero, Portillo, Ovelar, Benito, & Romo, 2010).

However maybe the most important problem to this integration in Educational Institutions is the resistance to change. If the integration of both environments involves changes in the code or in the way
things are done, many institutions will not willing to invest money, effort and/or time on it. So how is possible to enable such integration? And how to do it in a simple way that helps the teachers and the institution to include those 2.0 tools that the user really uses.

Conde et al. (Conde, García-Peñalvo, & Alier, 2011) propose four possible interoperability scenarios to achieve this interoperability. One of them is based on the web services layers included in the LMS, but its implementation implies to change the 2.0 tool to use and the solution would be constrained to an specific LMS (i.e: the tools adapted to Moodle would not be valid to Blackboard). Other scenarios are based on interoperability specifications, which address the problem of the previous one, but most of these solutions also involve changes in the platform and/or the tools, something that does not fit with the institutional requirements (as previously commented). In order to facilitate this integration in a way, that does not imply changes in the learning system, the best way is to implement second scenario proposed. It consists on the use of external 2.0 tools to carry out learning activities outside the LMS. The user may use an external tool such as Flickr, Blogger, Wikipedia or YouTube in her PLE and later the teacher must be able to evaluate her activity. In these cases the interaction is responsibility of the teacher. She should check the results of the activities carried out in the PLE and measures it in the institutional context, i.e.: by using a Moodle offline assignment.

This means that the user can define their PLE in different ways because it is not necessary to establish communication channels with the PLE. The simplest way to do this is by using different learning tools and services without a framework to contain them (Adell & Castañeda, 2010; Attwell, 2007; Downes, 2010). Other possible way can be to add those tools in spaces such as portals and represent them in different ways (Al-Zoube, 2009; de-la-Fuente-Valentin et al., 2008; Godwin-Jones, 2009; Martindale & Dowdy, 2010; Palmér et al., 2009; Põldoja & Laanpere, 2009; Santos & Pedro, 2009; Torres et al., 2008; Tu, Blocher, & Gallagher, 2010; Scott Wilson et al., 2009).

In order to show clearly how this can be performed in the following section an experience of the application of this scenario in a university context is shown.

3. The application of 2.0 tools in learning environments

3.1. The subject

The experience has taken place in an elective subject of Polytechnic University of Catalonia. This subject is called “Social and Environmental Aspects of Information Technology (ASAI)”. ASAI subject could be chosen by students of Degree in Informatics Engineering, Diploma in Computer Software and Diploma in Computer Systems. During the subject, students learn the environmental and social effects and impact of information technology, its history and the legislation that affects it. All the while, they should not overlook ethical requirements and professional ethics. The generic character of the subject matter and the practical impossibility of addressing the field in its entirety, also mean that students must be able to make critical readings of the diverse range of general texts covered in the subject.

The subject comprises 7.5 credits (five hours of class each week in a 13 or 14 week term). The sessions could be split as follows: an hour for teacher presentations, two hours on computing history (student assignments) and two hours on the "social impact" of computing (student assignments). In addition to these sessions and to complete the 7.5 credits they have to perform personal work on the subject and to do this they can employ the University Online Campus, called Atenea and based on Moodle and also during the subject it is proposed the use of Twitter (http://twitter.com/) as a collaboration and work tool. This work is taken into account during the evaluation.

This evaluation consist of: a final exam that represents the 40% of the final grade; several; two survey and presentations which are the 30% of the final grade and a 30% that is dedicated to other activities
related with the participation of the student. In this case the active participation in twitter is valued as the 30%.

In the following sections the tool that has been applied to the subject is described and the results that such application generates.

3.2. The Tool and the Application Context

The 2.0 tool that is going to be used in this subject is twitter, a microblogging tool. Microblogging is a quite widespread activity that consists on the act of broadcasting short, real-time messages. It is seen as an increasingly popular and socially acceptable means of information Exchange (Grace, Zhao, & boyd, 2010). This kind of activity is a smaller version of weblogs enriched with features for social networking (Böhringer, 2009). It allow users post short messages into their public microblog space, subscribe to other user’s spaces, list messages related with an specific issue and so on. The content of the users’ messages goes about her activities, opinions and status; sharing news and opinions with interested readers; and seeking knowledge and expertise in other public messages (Java, Song, Finin, & Tseng, 2007; Zhao & Rosson, 2009).

There exists some previous works that discusses the possibility to use microblogging as a learning tool (Ebner & Schiefner, 2008; Grosseck & Holotescu, 2009; Skiba, 2008; Ullrich et al., 2008). In this experience the idea is to be able to take into account the activity that occurs in such tool into a personal context, from inside the LMS; and in this specific case to evaluate the quantitative improvement it supposes.

In order to do this during the subject some activities are based on twitter for example to comment some news related with the Information Technologies. All the students’ tweets are channelled through the hash-tag #asaifib (a word with that begins with the # symbol and is used in each tweet related with a specific context or activity) and the publications are shared with all people looking for that tag. All students are supposed to use the tag and to control the messages that include the tags so all they can see publications related with the subject. But how to analyse that information, how to measure it in the LMS and how does the learning of the user be improved by it?

3.3. Application and results

As commented above, during the subject, the students have used twitter and the hash-tag to comment some news, issues and the face-to-face sessions related with the subject. This means a great quantity of activity that the teacher should review to evaluate students’ activity into the LMS. In order to manage this information is necessary to use analysis tool. During this experience is used Twapperkeeper, which recently has been included in Hootsuite (http://hootsuite.com). This tool generates reports with statistical information about different issues related with the activity in social networks, such as: general information, the top 10 twitter users, top 10 @reply recipients and/or mentions, top 10 “conversations”, top 10 tweeted hashtags, top 10 tweeter urls, more used words and so on. In this case the report will be based on users’ tweets including the hash-tag #asaifib (Fig 1).

With that statistical information and real students’ tweets, the teacher can evaluate the participation of the user and the quality of that participation. Thus she can assess student’s activity in the LMS. To do that the teacher uses an offline assignment in Moodle (Fig 2 – Part A). This activity defines a space into the context of the LMS (the ASAI course) in which the teacher is able to include the evaluation of an activity that is not in the LMS.

The student tweets her opinion about different issues and news in twitter, which is integrated in her PLE. The teacher should access to the analysis system (hootsuite), check the activity of each student,
analyse the quality of the tweets and evaluate and provide feedback to the user through the offline activity defined in Moodle (Fig 2 – Part B). The student can review her results and feedback through such activity. In this way, an easy integration of the LMS and the 2.0 tools is achieved.

The results of the application of Twitter to the subject are shown in Fig 1: 954 tweets during the term in which the subject is carried out. 169 twitter users, something that shows that including twitter in a subject means to open it to other users because the subject has only 46 students and 2 teachers, so other users are participating on it (between these new users there are several experts in issues related with the subject). From those tweets the 80% (763) were made by 35% (57) of the users, something normal because the users that have participated more during the subject are students and teachers (a total of 49 users quite near to the 35% previously commented).

Fig 1. – The figure shows general data about the tweets, the top 10 twitters and statistics related with the number of tweets per twitter user.
Fig 2. – The part A of the figure shows Moodle activity combo-box and the offline activity select. On the part B is shown the interface that the teacher has to measure the external activity and provide feedback to user.

![Image of Moodle activity combo-box and offline activity select](image)

Use of twitter influence on grades

![Graph showing comparison between grades with and without Twitter](image)

Fig 3. This figure shows the difference between the grades using and not using twitter. There is a clear improvement of the grades especially in the section between 5-7 and 7-9.

Regarding to the improvement in the grade of the user by using twitter Figure 3 can be observed. It shows the differences in grades between the students without the use of twitter (taking into account just the exam and the quizzes that the student performs) and by adding the tool to supplement the subject (considering the exam, the surveys and the twitter activity). In such Figure can be seen the grade in a 0-10 scale. Without using twitter there is one more failure and there are significant worse grades than using twitter.

It is especially significant the improvement in the middle section grades. That is to say in grades in ranges between 5-7 and 7-9. This can be because the not very diligent students are not going to work during the subject independently of the tools used (from the students with a grade under 5, four didn’t finish the subject exam) and the best students are going to work independently of the tools used, so the
differences in this two groups are not really important. Despite of this one more student pass the subject in the case of twitter use, which shows that the application and consideration of the 2.0 tool activity could help to pass the subject.

4. Conclusions

During this paper the benefits of the application of 2.0 tools have been shown. The learning tools that students and teachers use are not limited to the institutional ones. They use Wikipedia, Twitter, Flickr, Slideshare, experts’ forums, etc. Such tools enrich learning activities and, if the activity carried out in them is taken into account, teachers will have a best idea about the students’ skills and knowledge. The problem is how to apply it in different learning institutions.

The institutional learning systems are like walled gardens, that need to be open to include new tendencies and trends in order to improve learning and to evolve. During this article a way to facilitate that integration is described. It is based on the use of 2.0 tools (included or not into a PLE) that are taken into account from the LMS to measure the student activity. To illustrate that integration an experiment has been described.

During this experiment several conclusions can be extracted. The first is that the integration between the LMS and other tools, such as 2.0 can be very easy without the necessity to modify the institutional learning platform. However this means more teacher work because she has to check different environments and tools.

Other conclusions are based on the 2.0 tools application. These tools foment the student participation (something evident observing the data related with the tweets); put the students in contact with experts in issues related with the subject; and motivates them, so they can facilitate to pass a subject and to achieve better grades.

As future work some other tools and integration scenarios should be taken into account and also not only quantitative but also qualitative experiences should be done.

Taking all this into account it is evident that new tools can improve learning and they must be considered in institutional environments. Integration is possible and should be achieved.

Acknowledgements

This work is partially supported by the Ministry of Industry, Tourism and Trade of Spain (project TSI-020302-2010-2), the Ministry of Education and Science of Spain (project TIN2010-21695-C02) and the Government of Castilla y León through the project GR47.

References


