HORIZON REPORT

2010 Iberoamerican Edition

A publication by
THE NEW MEDIA CONSORTIUM
and
the UNIVERSITAT OBERTA DE CATALUNYA

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EXECUTIVE SUMMARY

The series of *Horizon Reports* is the most tangible outcome of the New Media Consortium's Horizon Project, a qualitative research endeavour launched in 2002 which identifies and describes the emerging technologies with the greatest potential to have an impact on teaching, learning, research and creative expression in the global education field. This volume, the *2010 Horizon Report: Iberoamerican Edition,* focuses on research in countries of the iberoamerican region (including the whole of Latin America, Spain and Portugal) and in the field of higher education. The *2010 Horizon Report: Iberoamerican Edition* is the first to offer this regional contextualization and has been produced by the NMC and the eLearn Center of the Universitat Oberta de Catalunya (UOC).

Throughout the report, special attention has been addressed to the specificities that show the heterogeneity of Ibero-America, but which, at the same time, constitute a separate identity from the rest of the world. We believe that one of the Identity values of the iberoamerican region s its sense of community, collaboration and extremely flat, horizontal communication. This community feeling is also strengthened by a strong spirit of democratization, opening up and debate. However, unlike other regions, the role of the teacher is still a pillar of unquestionable authority, as well as its institutions which, as we will appreciate later, are still very resistant to organizational changes.

The use of English as the *lingua franca* and the digital divide have in many cases represented a barrier, both in terms of iberoamerican voices being heard beyond its borders and innovations in learning technology being easily implemented in classrooms. These and other points of view - relating to politics, socio-economic resources and different cultural characteristics - are those which have been taken into account in order to give the *Horizon Report* an iberoamerican slant.

Each edition of the *Horizon Report* describes six emerging technologies or practices which will probably be in widespread use on university campuses within adoption horizons over the next five years. Each report also presents critical trends and challenges which will have an effect on teaching and learning over the same period of time. In order to identify these areas, the project draws on an ongoing conversation among leaders in the fields of education, technology, business and industry informed by a review of published resources, by current research and practice. All this bolstered by the experience of the NMC, the UOC's eLearn Center and the respective communities of the members of the Advisory Board of the *2010 Iberoamerican Horizon Report.* The Advisory Board - made up of a group of experts in education, communication and technology from different parts of Ibero-America and the international arena - was chosen to represent a broad range of perspectives in the work undertaken to achieve a consensus on the six technology issues or trends featured in this report. The report sets out to highlight the innovative work which is being undertaken in iberoamerican higher education institutions, and seeks maximum diversification in its sources.

The format of the *Horizon Report* is the same in all its editions, and begins with an open discussion on the trends and challenges identified by the Advisory Board as the most critical for the next five years. The main section reflects the focus of attention of the Horizon Project; namely, emerging technologies. Each topic opens with an overview describing the technology at hand, followed by a discussion of its relevance to teaching, learning, or creative inquiry. Examples of how the technology is currently employed, or how it could be applied to education, illustrate its potential. Finally, an annotated list of materials in Delicious for further reading is provided for those who wish to explore a topic in greater depth.

The intention of the Advisory Board, as well as of the authors of this report, is to use the document as a working paper, a blackboard that can be rewritten and aims to stimulate an interdisciplinary reflection on the use of technology in education within the iberoamerican context. As an open working document, the report brings together different views about the future and the most significant trends set out by a group of experts. It is not therefore a prediction for the future, nor is it a binding manifesto for politicians and others in positions with decision-making power. It is an opinion, albeit an opinion based on years of experience and research in the field and, above all, agreed and consensed.

Key trends

The technologies featured in each edition of the *Horizon Report* form part of the contemporary context which reflects the current reality in the

academic field and the world in general. In order to ensure that this is the perspective taken, the Advisory Board researches, identifies and classifies the key trends affecting the practice of teaching, learning and creative inquiry, and uses them as a reference for the work subsequently undertaken. These trends emerge through an extensive review of topical articles, interviews, documents and the most recent research. Once identified, the trends are classified according to how significant their impact on education in the next five years might be. The seven trends below have been identified as key factors in the adoption of technology for the period 2010 to 2015 in iberoamerican higher education. They appear on this list in the same order they were classified by the Advisory Board.

- *Knowledge is "decentralized" in production, distribution... and re-use.* The facilitation of content production and dissemination processes in multiple formats has increased the number of exploitable online resources ad infinitum, and therefore changing the perception and evaluation of knowledge production. Decentralization of content production among teachers and students (and third parties) is made possible, as well as re-usage.
- *Technology continues to have a profound effect on the way we work, collaborate, communicate and continue to make progress.* In Ibero-America, physical access is still a problem in many regions. Even more, a digital skills divide has now been added to the initial digital access divide. The speed at which technology develops means that new access (to mobile Internet, broadband Internet, etc.) and skills (information literacy, media literacy, etc.) divides are appearing before the previous ones have been overcome, giving rise to new potential situations of inequality.
- *Technology is not only a means of teaching students, but also a method of communicating and establishing relationships, as well as an ubiquitous and transparent part of their lives.* Among all the changes brought about by technology, the social relationship area is one of those which have had the most noticeable impact, particularly in the field of education. Communication between all the players in education has become more open, multidisciplinary and multisensory and is gradually being integrated into all our activities.
- *Teachers - and many of the institutions in which they work - are gradually shedding their misgivings about technologies, and the distinction between offline and online is slowly disappearing.* Increasing numbers of teachers are thus starting to use different technological resources in their educational practices, from the now commonplace email to complex digital simulation systems.
- *The way in which we think about learning environments is changing. Traditionally, and until quite recently, learning environments were associated with physical spaces.* Today, however, the "spaces" where students learn are increasingly community-based and interdisciplinary and are supported by technologies associated with virtual communication and collaboration. Spaces are transformed into a blend of classroom and virtual environments, where the borders between both worlds become blurred and are experienced by students as just one world.
- *The technologies we use are increasingly based on cloud structures, and our idea of support for information technologies is tending to become more decentralized.* The acceptance and growing implementation of applications and services based on cloud structures is not only changing the way in which we set up and use software and data storage, but also how we conceptualize these functions. It does not matter where we store our work, but that our information is accessible, irrespective of where we are or the device we have chosen to use.

Critical challenges

Along with the current trends, the Advisory Board also points out the critical challenges faced by educational organizations, particularly those which are most likely to continue to affect education in the five years covered by this report. Just like the trends, the challenges have been identified through a meticulous analysis of current events, documents, articles and similar sources, as well as using the personal experience of the members of the Advisory Board in their roles as leaders in education and technology. For this edition, the Advisory Board has taken into account the diversity of iberoamerican countries and the fact that the challenges faced are even more acute in some countries, regions and social groups, particularly as far as access to technology is concerned. As a result,

the shared challenges identified within the group tend to be generalized, although there is agreement on their importance. Those which were considered most significant in terms of their impact on teaching, learning and creative inquiry in the coming years are included on this list, according to the order of importance given to them by the Advisory Board.

- *Teacher training on the use of digital media in teaching and learning processes remains a challenge. Identifying and understanding the educational potential of these technologies will encourage their use in the classroom.* The training of teachers from an integrated perspective, in which the use of technological resources forms an inseparable part of the practice of teaching and learning, is a primary condition for the significant inclusion of digital media at all levels of education.
- *The management of integrated change in higher education must be seen as a systemic and transforming process which contributes to economic growth, human development and social cohesion.* Although educational policies cannot be imposed, it is the responsibility of those who have been chosen for this purpose to consider, reflect and make decisions to promote the necessary changes; otherwise we run the risk of them never happening. This includes a change in the role of educational institutions, forcing reflections to be made which prevent everything from continuing as before, and enabling tangible and sustained changes to take hold. There is a need for a redefinition of the educational model which considers new ways of generating, managing and transmitting knowledge.
- *Digital literacy must become an essential skill in the teaching profession.* In spite of the existence of a widespread consensus on its importance, training in techniques and skills relating to the digital field is still the exception in teacher training programs. Skills and standards based on tools and platforms have proven to be somewhat ephemeral, given that digital literacy is not so much to do with tools as thought: digital skills have many different aspects (technology, information, multimedia content, digital identity, etc.) and must be comprehensively tackled.
- *Training students in the use of new audiovisual communication media and languages is a critical factor.* Students need new knowledge and skills in the writing and communication field which are different from those required just a few years ago. It is becoming increasingly necessary to have specialized technological knowledge in order to collaborate on a global scale and to understand the content and design of new media. New literacies and their evaluation must therefore be included in curriculums, which will require an understanding of the full extent of the meaning and scope of these new skills and abilities.
- *The use of technology for the appropriate processing of information and construction of knowledge is still too infrequent.* A key challenge is not only to reflect on the use of emerging technologies but to place them in the dialectic of information processing for the solution of complex problems faced by society, as this is one of the challenges of higher education. It is not only a question of whether or not to incorporate technologies, but of putting students' needs for understanding first and designing new complex ways of working with the reality facing us in order to build up knowledge on it.
- *There is a need for an adaptation of teaching practices to the requirements of the digital and knowledge society.* Technologies may place the student in different spaces, as the protagonist and author, but their role is still predominantly that of a recipient within the context of formal education. Underlying this phenomenon is the fact that it cannot be limited to the proliferation of the use of technology, as many other socio-cultural aspects have caused the change in current educational and working practices. The low rate of appropriation of technology by the educational sector may be due, among other reasons, to the fact that teachers have been trained as users and not leaders in the design and implementation of the use of technologies for educational purposes.

These trends and challenges have a profound effect on the way in which we experiment with emerging technologies and how we implement and use them in the educational world. We will thus use these trends and challenges as a framework for considering the probable impacts of the emerging technologies mentioned in the sections below.

Technologies to watch

The six technologies featured in each *Horizon Report* are situated on three implementation horizons which represent the periods of time in which they will become tools in widespread use in teaching, learning or creative inquiry.

The short-term horizon predicts the probability of widespread implementation in institutions over the next twelve months, the medium-term horizon within two or three years, and the long-term horizon in four or five years. It should be said that the *Horizon Report* is not a predictive tool. Rather it has the function of highlighting emerging technologies with considerable potential for the areas of interest to us: teaching, learning and creative inquiry. Each of these technologies is already being studied in several innovative institutions throughout the world, and the work presented here reveals the prospect of a wider impact.

The technologies with a short-term horizon – in other words, within the next twelve months – are collaborative environments and social media.

- **Collaborative environments** Collaborating with others in the carrying out of activities or the production of joint products, be it in person or online, is increasingly becoming an essential skill in iberoamerican society, as well as in the rest of the world. At the same time, collaboration is recognized as a valuable approach and an effective learning method, which is gradually becoming established in different educational contexts and, albeit more slowly, in the academic arena as well. Technologies inevitably have a role in these processes, but they can also facilitate and support them in various ways, helping to establish optimized environments for learning and collaborative work in classroom or blended education scenarios, and also online. There is currently a wide range of technologies, from the simplest to the most sophisticated, which can be combined with each other to increase the number of (asynchronous or synchronous) communication options and facilitate the collaborative production of content or the exchange and rearrangement of already existing content, without it mattering that the people are located all over the world.
- **Social media** Web 2.0 technologies have transformed the media field by bringing different tools together to enable the creation, classification and exchange of user-generated content. Pictures, videos, audio clips, podcasts, multimedia presentations, etc. are now fully accessible media for any Internet user. Any user of these applications can not only easily consult them, but also produce them, rate them, create shared collections, comment on them, evaluate them, etc. On the one hand, the use of these media dramatically increases the diversification of information sources and the availability of multimedia resources which could possibly be adapted in order to be included into pedagogical proposals. On the other hand, it enables teachers and students to become authors of different types of works, inviting one to reconsider the very meaning of knowledge construction processes in the academic field. Lastly, through publication on the Net, social media increases the possibilities of dissemination of the works themselves, in iberoamerican languages, free of charge (or very cheaply) and on a global scale.

The second adoption horizon is established in a period of two to three years and includes two technologies which although widely available are still some way from being regularly used in education: open content and mobiles.

- **Open content** In Ibero-America, there are two main aspects to the trend towards open content. Firstly, it reflects a change in the way in which academic institutions conceptualize learning as something which has more to do with the production of knowledge than the transmission of information in their courses. Secondly, the fact that the adoption horizon is situated in a period of two to three years is justified by iberoamerican countries' needs and special situation compared to other regions of the world with regard to two fundamental aspects: the delayed arrival of ICTs – particularly broadband connectivity – and the language barrier for faster adoption of open content.
- **Mobiles** In many areas of the world, mobile computing is becoming an increasingly indispensable part of daily life. One of the clear determining factors behind this phenomenon is the increasing ease and speed with which Internet can be accessed thanks to mobile phone networks and wireless connections. An analysis of recent telecommunications market reports for the iberoamerican area shows a

similar trend. Furthermore, a whole range of mobile devices (phones, *smartphones,* PDAs, Tablet PCs, *e-readers, netbooks,* etc.) run applications which enable a wide range of tasks to be carried out and facilitate access to services available on the Net which are being extended every day and mostly offer free access. Some of these devices have already penetrated all social levels in Ibero-America, with a very high average density. This reality has increased and extended the possibilities of immediate access to all kinds of information anywhere and allows more flexible and contextualized pedagogical designs to be created.

In the long-term horizon – established at four or five years for widespread adoption, but with use already seen in some sectors – are augmented reality and the semantic web. Neither of these two technologies is yet common in educational institutions, but the high level of interest and amount of research undertaken in both areas suggests that they are worth monitoring closely.

- **Augmented reality** What was until recently experimental technology, restricted to the field of expert technicians and researchers, is becoming increasingly accessible. Today, various devices already available for a sector of the iberoamerican population and with a trend towards greater penetration (mobiles, video game consoles, PDAs, tablet PCs, etc.) are equipped with the tools necessary to implement augmented reality. In the field of iberoamerican higher education, augmented reality is seen as a technology capable of contributing significant changes to the way in which students of different subjects perceive and access physical reality, the latter seen as spaces, processes or objects, thus providing richer and more immersive learning experiences. Augmented reality can facilitate the understanding of complex phenomena, making it possible to see the environment and individual objects from different angles, with a view which is more comprehensive, richer and detailed, as well as being complemented by additional digital data. Any physical place can be converted into a stimulating training scenario through the use of augmented reality.
- **Semantic web** The main idea of the semantic web is that although online data are available for search, their meaning is not: computers are very good at detecting words but very poor at understanding the context in which key words are used. The still incipient - but promising - developments of the semantic web enable content to be provided with this context. This makes it possible for information searches to be more precise and, above all, for the results to be much more valuable and relevant. The specification of tacit knowledge is also made easier, an application which is particularly useful when recovering dispersed knowledge generated outside traditional knowledge sources. The information recovered is also not only of a higher quality, but is also easier to be reused in diverse applications other than the purpose for which it was produced. The semantic web is thus often the engine behind other technologies, such as augmented reality, mobility and geolocation tools or social media.

Each of these technologies is described in detail below in the body of the report. Our research indicates that the six technologies, taken as a whole, will have a significant impact on organizations focused on learning in the next five years.

Policy recommendations

Unlike other reports in the Horizon series, the Advisory Board of the *2010 Horizon Report: Iberoamerican Edition* deemed it appropriate to go beyond the descriptive phase of other reports and put forward proposals according to the data collected. The policy recommendations of the *Horizon Report: Iberoamerican Edition* aim to offer some possible answers to readers who, having read the report, are left with a feeling of "now what?" The recommendations aim to shy away from the axiomatic tone of a maxim, tending more towards constructive advice and mutually agreed reflection. They also to some degree offer a summary in the form of preliminary conclusions drawn during the process of producing the report which, as such, aim to invite further action.

- *Leverage the beneficial impact in the costs and economies of scale of digital technologies.* The most direct and proven impact of information and communication technologies is the dramatic cost reduction in knowledge-intensive sectors (such as education), as well as an increase in returns to scale. Their implementation in the value chain enables the generation of new products and processes which result in increased economic productivity and competitiveness. This leverage,

however, must be undertaken taking into account the weaknesses of local industry: the high costs and barriers entailed by the exploitation of intellectual property rights or the acquisition of software and hardware predominantly from abroad.

- *Accompany the technological change with an organizational, institutional and systemic change.* Many of the technological changes exert – and will do so even more in the future – strong pressure for social, economic and cultural changes to take place, particularly in the field of education. Whether these changes will be used positively, or whether they will take place despite the resistance of tradition and inertia, largely depends on institutions' flexibility and foresight. Technological changes, as part of a cycle, have social origins and a social impact.
- *Train educators as the cornerstone of the appropriation of technologies in the educational field.* All changes, particularly those of great importance, require reflection and reconsideration of the roles and powers of all the parties – people and institutions – in the system. Accordingly, there is a need for training which enables changes and their nature to be understood, so that they can be redirected, catalyzed or exploited. The training of educators – and also managers of the educational system, students and the community in general – is thus a cornerstone for getting the most out of technologies in the educational field.
- *Build bridges between formal and informal education.* One of the changes that technology has apparently caused is the blurring of the boundaries between the fields of formal and informal education. New technologies have made access to content and people ubiquitous, making the existence of physical walls and conceptual distances between many spheres of society irrelevant. Whilst bridges have already been built in the field of technology, we believe it is necessary to build more in the organizational, systemic and social fields in order to unite the spheres in which education takes place; in other words, as has become increasingly clear, all areas of life.
- *View formal education as part of a broader framework of lifelong education.* As the border between the formal and the informal has become blurred, the period of time that a person devotes exclusively or intensively to educating themselves has also become less clear-cut. The constant need to update knowledge makes it essential for this period to be extended, starting at a very early age and lasting at least as long as the individual's working life. Furthermore, social and community relationships also increasingly require more education; the age for education should therefore be extended to cover the whole of people's lives.
- *Deal with the digital divide as far as inequality in physical access to technologies is concerned.* We must be aware that the use of the vast majority of new technological applications means having access to computers, mobile phones and a broadband Internet connection. We therefore believe that policies for the promotion of the information society which aim to achieve universal access to all kinds of digital content and services must not be neglected.
- *Address the digital divide as far as inequality in the development of skills for appropriate use and appropriation of technologies is concerned.* In relation to the previous point, access or even use is not enough unless it is use which empowers the person, increasing their capabilities and freedom. We believe that further work should be undertaken with regard to infrastructures to ensure that they are tools in the hands of citizens and that citizens do not become puppets or slaves subject to the vagaries of the infrastructures. Digital skills must be comprehensively developed and form an integral part of educational and human development policies.

The Horizon Project

Since March 2002, under the emblem of the Horizon Project, the New Media Consortium has held a number of conversations and dialogues with hundreds of technology professionals, university technologists, leading university professors and representatives of the most important companies in more than two dozen countries. In each of the last eight years, these conversations have resulted in the publication every January of a report focusing on relevant emerging technologies in higher education. While the report is being produced, the Advisory Board keeps the dialogues going using a large variety of articles, published and unpublished research, papers, expert

blogs and websites. The result of these dialogues is a list of key technologies, trends, challenges and issues which are reflected on by experts from the technology industry, higher education and organizations focused on education.

In 2008, the NMC embarked on a new series of regional and sector-based editions to complement the *Horizon Report,* with the twin aims of understanding how technology is being absorbed through a more immediate approach, and also noting the contrasts between technology use in one area compared to another. This report, the *2010 Horizon Report: Iberoamerican Edition,* is the first of a new collection focusing on new technologies in education in Ibero-America, Spain and Portugal. To date, complementary editions have been prepared that focus on Australia and New Zealand, on the K-12 sector (primary and secondary education) and on small and medium-sized enterprises. The main *Horizon Report,* focused on higher education, is translated into several different languages every year. Over all the editions, the readership of the reports is estimated at over 500,000 worldwide, with readers in more than 50 countries.

Like the university-focused effort from which this report emerged, the iberoamerican project, referred to informally as Horizon.Ib, uses qualitative research methods to identify the technologies selected for their inclusion in the report. The process begins with an evaluation of the work of other organizations, a close examination of topics previously detailed in the *Horizon Report* series and a review of the literature with an eye to detecting interesting emerging technologies. When a new cycle begins, little is known, or even can be known, about the appropriateness or efficacy of many of the emerging technologies for these purposes: the Horizon Project itself is expressly focused on technologies not yet in widespread use in education.

By engaging a wide community of interested parties and diligently searching the results of published research, the Internet and other sources, the necessary information is collected early in the process to allow the members of the Advisory Board to form an understanding of how each of the technologies discovered might be used in settings outside of education, to develop a sense of the different technologies' potential for educational environments and to envision applications of the technology for teaching, learning and creative research. The findings are discussed with teachers, industry experts, technologists and, of course, the Advisory Board. Of particular interest to the Advisory Board each year is the search for educational applications for these technologies that may not be obvious or easy to include.

The 44 members of this year's Advisory Board of the iberoamerican *Horizon Report* were deliberately chosen to represent a broad spectrum of the education and communication world, as well as the political arena and the technology industry sector. They embarked on a comprehensive review and analysis of research, articles, documents, blogs and interviews, discussing existing applications and brainstorming new ideas. Lastly, they ranked the issues on the list of the candidate technologies according to their potential importance for teaching, learning and creative research. This work was carried out online and during a special face-to-face meeting held in Puebla (Mexico) in April 2010. The Advisory Board's work is filed and may be reviewed on the project wiki at http://ibero.wiki.nmc.org.

Each *Horizon Report* is produced over a period of just a few months so that the information will be current and relevant. This year, work to produce the report began in March 2010 and ended when the report was released in June 2010, a period of little more than four months. The six technologies and applications which were at the top of the final list - two for each implementation horizon - are detailed in the sections below.

Each of these sections includes detailed descriptions, links to active demonstration projects and a wide range of additional resources related to the six technologies described. These descriptions are the heart of the *2010 Horizon Report: Iberoamerican Edition* and will fuel the work of the Horizon Project in the period 2010-2011. For those who would like to know more about the processes followed to generate the *Horizon Report,* we refer you to the research methodology section at the end of the report.

COLLABORATIVE ENVIRONMENTS

Time-to-Adoption: one year or less

Collaborating with others in the carrying out of activities or the production of joint output, whether in person or online, is increasingly becoming an essential skill in iberoamerican society. At the same time, collaboration is recognized as a valuable approach and an effective learning method, which is gradually becoming established in different educational contexts and, albeit more slowly, in the academic arena as well. Technologies inevitably have a role in these processes, but they can also facilitate and support them in various ways, helping to establish optimized environments for learning and collaborative work in classroom or blended education scenarios, and also online. There is currently a wide range of technologies, from the simplest to the most sophisticated, which can be combined with each other to increase the number of (asynchronous or synchronous) communication options and facilitate the collaborative production of content or the exchange and rearrangement of already existing content, without it mattering that the people are located all over the world.

Overview

Collaborative environments are learning spaces which offer optimum conditions for teamwork and joint learning. This inevitably includes both support technology and the use made of it: in other words, methodologies which support the working and collaborative learning processes. The tools and environments in this category thus cover a wide spectrum of activities based on interaction and social practice, including everything from the exchange of ideas and knowledge to learning distributed through participation in projects or the joint creation of content.

We can find technologies expressly designed to support collaborative environments or those which, despite not having been developed for this purpose, are used and on occasions adapted for it, with varying degrees of spontaneity. The role of technology in collaborative environments may be isolated and complementary (as is the case of classroom environments with virtual support), partial (as in *blended learning environments*) or total (virtual learning environments). In these situations, technology increases the number of (asynchronous or synchronous) communication options and facilitates the collaborative production of content or the exchange and rearrangement of already existing content, enabling teamwork to be relocated.

Collaborative work, in both online and classroom environments, is also increasingly supported by technologies such as cloud computing, the ubiquitous wireless connection, mobile devices, virtual worlds or social networking tools. From this perspective, there is a wide range of technologies used as support for all forms of cooperation and collaboration, which are established to varying degrees in different sectors. In the field of digital culture, for example, collaborative environments have emerged as new social architectures for the construction of knowledge, opening up a whole range of possibilities in the field of education. An interesting case, due to its size, is the Wikipedia in Spanish (http://es.wikipedia.org), with 500,000 articles published in August 2009. The Spanish Wikipedia is the only one in which science articles come out on top in terms of the number of visits in comparison with other categories, followed by geography, art and history articles, and a long way ahead of the so-called articles on “popular culture” (television, cinema or video games).

The list of tools which can be used as support for collaboration is so extensive that it is difficult to produce a classification: scheduling and planning of group work, shared content organization and global asynchronous or synchronous communication, text-based or by video conference. The trend also increasingly points towards a combination of different tools within a single “multifunctional environment”; users can therefore choose the one which best covers the needs posed by the collaboration at any given time.

Relevance for teaching, learning or creative inquiry

There is a multiple and multi-faceted variety of relevant applications which can be achieved from this group of technologies in the context of iberoamerican higher education. For a start, the support of collaborative environments can be considered on three levels: between students, between students and teachers, and between teachers. The current usage trends are thus focused on both teaching and learning processes and teamwork and collaborative research.

One has to start from the premise that collaborative environments are a requirement of different sectors of today's iberoamerican society. A high value is given to collaboration in the work environment and professionals in all sectors are increasingly expected to be able to work in inter-regional and international networks. The problems and interests of different social groups can also be tackled collaboratively through learning and practice communities. Furthermore, the idiosyncrasy of iberoamerican conversational and participatory culture is suited to the adoption of these types of environments. In the field of higher education, they can influence the democratization of the training process and the social construction of society since, on the one hand, they increase the possibilities of participation for groups in isolated contexts and regions and, on the other, they educate students in teamwork, community participation and the collective production of knowledge.

Many universities are developing virtual campuses which offer a specific range of online courses or courses to complement classroom education *(blended learning).* Most of these campuses include discussion spaces such as forums and chat rooms, and are increasingly opening the door to social technologies such as wikis and blogs, as well as RSS readers or shared social bookmarks, which provide fast updated access to content relating to an area of specific knowledge. In distance learning, these types of environments are used to promote a feeling of belonging to a learning community, in order to increase motivation and involvement in the education process. As a learning strategy, collaborative environments enable the coverage of the development of interdisciplinary projects, directly located or situated in a social context, aimed at the resolution of local or regional problems, or based on joint investigation processes. Projects by students from different universities and/or countries are increasingly common, as they are able to benefit from diversity on different levels (disciplinary, perspective and cultural) and contribute to skill development (cognitive, instrumental and axiological).

In addition, teachers can improve their professional knowledge, participate in joint projects or simply share their affinity for particular issues, through the teacher collaboration networks. Collaborative environments may also be used for the development of interdisciplinary and inter-institutional research through the creation of working groups made up of researchers from different institutions and areas of research. The social network creation platform, Ning, for example, hosts multiple communities made up of teachers and researchers who are grouped into fields of specialization and professional development.

- **Production of academic papers.** At the Universidad Nacional de Mar del Plata (Argentina) collaborative learning environments have been used for the development of theses for postgraduate degrees of the Faculty of Economic and Social Sciences. These environments are used to provide collective support for the realization of works through *b-learning,* which involves two meetings in person and various activities through the virtual platform including chat tools, wiki, forum, collective activity log, etc. (http://www.inpeau.ufsc.br/wp/wp-content/BD_documentos/2145.pdf).
- **Researcher training.** One possible strategy for distance researcher training is to establish groups of researchers who make up virtual communities. In various Argentinean universities, such as the Universidad de Buenos Aires, the Universidad Nacional de la Plata and the Universidad de Lanús, and specifically in the Engineering faculties, technological platforms and collaborative working models have been developed which are implemented in the university researcher training programs (http://laboratorios.fi.uba.ar/lie/Revista/Articulos/060611/A6mar2009.pdf).
- **IT engineering.** Experience gained as part of the IT Engineering studies at the Universidad Politécnica de Valencia (Spain), in which students use a wiki as an instrument for the development of the activity, whilst the teacher makes use of wiki technology to monitor the work carried out, providing them with feedback and evaluating both the students' work in relation to the content of the subject and the method of teamwork used (http://www.um.es/ead/red/M12/10-Villanueva.pdf).
- **Tourism.** At the Universitat Oberta de Catalunya (Spain) a wiki on ecotourism has been developed which includes all the activities covered by the subject, as well as the continuous evaluation of the subject by the teachers. The collaborative production of the wiki content through the allocation of different roles enables students to understand and apply conceptual knowledge on ecotourism by means

of information searching, production, review and critical comparison (http://wiki.uoc.edu/tikiwiki3/tiki-index. php?page=Guia_Estudi).

Collaborative environments in practice

The links below provide examples of collaborative environments.

Aulanet2

http://aulanet2.ning.com

"AulaNet Buenos Aires" is a collaborative study platform which forms part of the course on "Internet and other IT tools in education: basic skills for their use in the classroom", run by Dr. Diego Levis and organized by the Centro de Documentación e Información Educativa, CENDIE (National Educational Documentation and Information Centre).

City Wiki

http://citywiki.ugr.es/

City Wiki is a universal space for collaboration and the exchange of knowledge and experiences which uses the wiki technology developed at the Architecture School of the Universidad de Granada.

Docentes innovadores.net

http://www.docentesinnovadores.net/

A 2.0 website which sets out to provide a virtual community for teachers and lecturers in Ibero-America to share experiences and promote and disseminate their pedagogical projects through the use of ICTs.

LAMS (Learning Activity Management System)

http://lamsfoundation.org

Free and open platform for designing, managing and distributing collaborative learning activities through various tools. LAMS is an initiative of Macquarie University (Australia) which can operate as an e-learning platform or be integrated into other LMSs. LAMS organizes international conferences and has an extensive community of users and developers.

Colombia Aprende Portal

http://www.colombiaaprende.edu.co

At Colombia Aprende, spaces have been provided for national inter-university collaboration, where institutions can share experiences, programs and content. The Colombian Ministry of Education has promoted this strategy through a bank of collaborative projects and the documentation of experiences in teacher training schools, where the initial teacher training is carried out. In 2009 the first Virtual Colombia Aprende Congress on Collaborative Projects was held (http://recreaula.wordpress.com/).

Red AGE (Educational Management Support Network)

http://www.redage.org/

The AGE network is a project promoted by the Agencia Española de Cooperación Internacional para el Desarrollo (AECID) in which the Universidad Auntónoma de Barcelona (Spain) and the Universidad ORT (Uruguay) participate. It sets out to promote academic exchanges between both universities and other Latin American university institutions which join the network.

For further reading

We recommend the following articles and resources for those who wish to find out more about collaborative environments.

Communities of Practice and Virtual Learning Communities

http://campus.usal.es/~teoriaeducacion/DEFAULT.htm

The magazine "Education Theory: Education and Culture in the Information Society", 8 (3), 2007. A special issue devoted to communities of practice and virtual learning communities which includes papers developed from different perspectives of analysis and application.

Virtual learning communities, dynamic spaces for facing the 21st century

http://www.tec.cr/sitios/Vicerrectoria/vie/editorial_tecnologica/Revista_Tecnologia_Marcha/pdf/tecnologia_marcha_23-1/23-1%20p%2019-28.pdf

Zúñiga Vega, Claudia Arnáez Serrano, Elizabeth. *Technology on the Move,* 23 (1) 2010. Presentation of the case of the Environmental Virtual Learning Community (CVAA) at the Tecnológico de Costa Rica, a website to support the inclusion of environmental aspects in university life.

ELI Discovery Tool: Collaborative Learning Workshop Guide

http://www.educause.edu/eli/collaborativelearning

Educause. 2010. Guide to resources on collaborative learning based on the ELI Online Fall Focus Session "Flattening the Classroom:

Building Collaborative Learning Environments". They enable the concept to be explored and analyze how emerging technologies could improve their application and maximize their use.

Estudo da percepção e potencial do uso de aplicações móveis para ambientes colaborativos

http://hdl.handle.net/10284/1224
https://bdigital.ufp.pt/dspace/bitstream/10284/1224/1/ir_cerem_2_2009.pdf

Steven Abrantes, Luis Borges Gouveia. July 2009. An article which sets out an experience of evaluation of the perception and potential of the use of mobile applications in collaborative environments developed at the Fernando Pessoa University in Portugal.

Web 2.0 tools for collaborative learning

http://remo.det.uvigo.es/solite/attachments/038_Web%202.0.pdf

July 2009. Jabbar Fahad Mohammed Abdul and Raúl V. Ramírez Velarded. Monterrey Institute of Technology, July 2009. A compilation of 2.0 tools which can be used to create collaborative environments.

WIKI and higher education in Spain

http://www.um.es/ead/red/M11/
http://www.um.es/ead/red/M12/

RED. Distance Learning Magazine. Special issues XI and XII in a joint publication with University Teaching Magazine (U Network). January 2010. A special issue devoted to the study of the use of wikis in the field of education.

Delicious: Collaborative environments

http://delicious.com/tag/hz10ib+collabspaces

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add others to the list, simply tag resources with"hz10ib" and "collabspaces" when you save them to Delicious.

SOCIAL MEDIA

Time-to-Adoption: one year or less

Web 2.0 technologies have transformed the media field by bringing different tools together to enable the creation, classification and exchange of user-generated content. Pictures, videos, audio clips, podcasts, multimedia presentations, etc. are now fully accessible media for any Internet user. Any user of these applications can not only easily consult them, but also produce them, rate them, create shared collections, comment on them, evaluate them, etc. These tools are free or very cheap and enable good results to be obtained with basic knowledge and a small investment. On the one hand, the use of these media dramatically increases the diversification of information sources and the availability of multimedia resources which could possibly be adapted in order to be included into pedagogical proposals. On the other hand, it enables teachers and students to become authors of different types of works, inviting one to reconsider the very meaning of knowledge construction processes in the academic field. Lastly, through publication on the Net, social media increases the possibilities of dissemination of the works themselves, in iberoamerican languages, free of charge (or very cheaply) and on a global scale.

Overview

The new social communication media are based on Web 2.0 technologies and enable the creation, classification and exchange of user-generated content. Pictures, videos, audio clips, podcasts, multimedia presentations, etc. are now fully accessible media for any Internet user through websites such as Flickr, YouTube, Vimeo, Blogger, Twitter, Delicious, Slideshare, etc. Any user of these applications – among many others – can not only easily consult the media available on the Net, but also produce them, rate them, create shared collections, comment on them, evaluate them, etc.

Beyond the technology used, the interest of the content lies in its capacity to generate interactions between users, the richness of the conversation sparked off by it and the way in which this discussion gives rise to new content which can in turn be recreated. Producing, commenting on and rating these media thus becomes as important as searching for, selecting and consuming them.

This represents a huge change in the way media are used and even considered, as well as the knowledge they transport.

Different technologies come together in the flow of social media, such as online communication, social networks, collaborative tools, social bookmarks, etc. They can therefore take on very different forms and formats focused on communication, multimedia production, games and entertainment, etc. Unlike the mass media, the tools for the production of social media are free or very cheap and allow amateur users to obtain good results without the need to invest in costly equipment, software or training. This makes them tremendously attractive to a new audience of "prosumers" (producers + consumers), which is growing in number all the time and has helped to make them a critical element on the Net due to their exponential growth in terms of both quantity and quality. Our notion of what is useful, aesthetically pleasing and interesting is constantly being redefined, constructed and legitimized by the collective intelligence of the millions of users of these media.

As well as the possibility of contextualization, production and distribution of local content, any social medium is an open channel which cuts across different countries, cultures, histories, etc. and can give a voice to minority groups, or simply facilitate the promotion of content not suitable for mass distribution through traditional media. They could therefore be said to be democratic media because of the access opportunities they offer and the type of production processes involved, enabling users to rearrange and create new work from the creations of others. Another added value of these media is that they link users to their activity; in other words, to their creations. The technology used automatically generates an activity log every time a user publishes, makes a comment, tags, etc. This enables the traceability of its production, thus facilitating the identification and monitoring of similar interests and subject areas.

In the iberoamerican region (and particularly urban areas), a high proportion of secondary and higher education students are regular users of devices connected to the Net, such as for example mobile phones, which enable them to access and, increasingly often, create these products. They use them above all

as spaces for entertainment and socializing, but also as a channel for expressing ideas and disseminating their own creations. Technological social media thus has a key role among the motivations and interests of young people. Participating in these media, producing and sharing small creations with their equals and other Internet users contributes to the construction of their (digital) social identity and an increase in their self-esteem based on the social recognition and profile achieved.

Relevance for teaching, learning or creative research

There are several aspects of social media which are of interest in the field of higher education. On the one hand, the use of these media leads to a huge increase in the diversification of sources of information and the availability of resources. These multimedia products can be easily integrated into education proposals, and it is possible to convert them into learning resources, either as part of a pedagogical design produced by the teacher or through the choice of the students themselves. This use also involves the use of functionalities used for making comments, rating or tagging, which the students can use to collectively classify and even "evaluate" a particular product. On the other hand, the possibility of producing different types of output raises both teachers and students to the status of authors. Lastly, through publication on the Net, social media increase the possibilities of dissemination of the works free of charge (or very cheaply) and on a global scale, a phenomenon which has been identified as "citizen journalism".

The use of these types of resources in university environments entails a change of mentality with regard to the "ownership" of ideas and at the same time establishes a different relationship with knowledge, which becomes dynamic, transformable and constructed socially in different contexts. It could thus be said that social media blur the barriers between formal and informal learning. Everyone, students and teachers, experts and beginners, professionals and amateurs, is on the Net being informed and informing, criticizing and being subject to criticism, exploring and creating within communities established according to their interests. The barriers between disciplines are becoming blurred, and the divisions between educational spaces formalized to a greater or lesser degree, work and leisure spaces, etc. are fading, leaving these spaces to form part of a whole which represents the learning history of each one. Similarly, the value of the learning content conveyed by these technologies is no longer determined so much by the content itself as by the use given to it, and the network that uses it and comments on it, thereby giving it meaning. This requires a thorough rethink of the meaning of knowledge construction processes in higher education and the way in which they take place. As students can also play the role of creators of learnable content, as well as that of assessors and disseminators of their own creations or those of their colleagues, the centre of gravity of the training process inevitably moves from the teacher to the student, and with it, their circumstances.

Social media can play an important role in distance or classroom learning environments, whether as a support resource or as the basis on which to establish collaborative projects which involve a complete sequence of study, design, assembly, production and publication of resources. These types of projects enable students to start from their previous knowledge, interests and motivations, and improve their exploration capability, as well as their individual and collective creativity. By integrating multiple forms of expression and multimedia communication, social media are adapted to different learning styles whilst at the same time being ideal for facilitating the development of complex learning, thereby promoting the development of learning communities. In spite of everything, the learning processes usually generated in the use of social media tend to consist of large-scale interaction and contribution to a broader social group than in the case of collaborative environments.

What's more, from a teaching and research perspective, these media enable academic and professional information to be shared in different formats, opening the door to innumerable opportunities for social and educational research, as well as experimentation in the creation of new services in higher education.

These media have emerged at different levels in iberoamerican universities. In some universities, they are starting to be included in pedagogical designs, with mechanisms being established for the production of content in accordance with quality criteria, sometimes established by the students themselves in the form of self-assessment or peer review processes. In these contexts, the nature of communication between teachers and students inevitably changes, the directionality of interactions is diversified and branches out, and the teacher

ceases to play the role of the cornerstone of the communication flows, which are multiplied and go beyond the walls of the real or virtual classroom. Elsewhere, they have an essentially disruptive role at the moment, which could lead to the mobilization of more traditional institutions in the longer term.

Shown below are some examples of projects applying social media in different disciplines:

- **Library 2.0.** The library of the Telecommunications Engineering School of the Universidad Politécnica de Madrid (Spain) offers various 2.0 tools (social bookmarks, microblogging, photos, videos, documents, etc.) to publicize the information and services of the library. (http://www.etsit.upm.es/biblioteca/biblioteca-20.html).
- **Teacher training.** The project "Congenia: Genuine Conversations", which examined important topics for learning to improve professional teaching, and was developed among teachers from three regions on the north coast of Colombia, made use of the exchange of video cases on classroom experiences. These cases were then reviewed and discussed with the other teachers with the intention of fine tuning the criteria for improving their interaction in the classroom (http://www.congenia.blogspot.com).
- **Institutional debate forums.** The Colombian National Education Ministry broadcasts meetings held to decide public higher education policies and is also developing, alongside the physical forums, virtual forums on which information is collected to be included in the formal discussion (http://redes.colombiaaprende.edu.co/foro/course/view.php?id=52).
- **Journalism.** Blogs are being widely used as an educational resource in university communication and journalism teaching in Ibero-America. They offer a platform for creating collective learning spaces through different strategies, such as the construction of communities specialized in communication, specific teaching uses and the creation of personal blogs by students (http://www.dialogosfelafacs.net/76/).

Social media in practice

The links below provide some examples of social media.

Video channel of the UNDP Virtual School

http://www.escuelapnud.org/portal/index.php/canaldevideos

The UNDP Virtual School, through its public video channel, produces and publishes educational audiovisual output and case studies which are available online and can be commented on by the academic community of the School. Teachers, authors and students are included in the production of these videos.

EduCamp Colombia, social software for teaching and learning, Colombia

http://educamp.wetpaint.com/

A Wiki platform providing access to activities relating to the EduCamp workshops which are devoted to the use of social software tools and offer a learning environment which reflects the characteristics of the current information environment. On the platform there are resources, workshop content and access to various interaction spaces on the Net.

Communal Distance Higher Education Space (ECOESAD), Mexico

http://www.ecoesad.org.mx/index.html

This space enables 39 Mexican public universities to work collaboratively through electronic networks, generating online content using social media.

Facebook Project, Argentina

http://www.proyectofacebook.com.ar/

A project developed in 2009 within the framework of the Cátedra de Procesamiento de Datos of the Communication Sciences Degree Course of the Universidad de Buenos Aires. The Facebook social network becomes the subject of analysis and the platform of a collaborative project for the social creation of an audiovisual end product.

Educational Networks 2.1 Project, Argentina

http://www.gabinetecomunicacionyeducacion.com/files/adjuntos/Redes%20Educativas%202.1%20Pistas%20para%20la%20nse%C3%B1anza%20y%20el%20aprendizaje%20colaborativo.pdf

The project, developed at the Faculty of Social Sciences of the Universidad de Buenos Aires, sets out to investigate the possibilities offered by social networks as a collaborative study platform at different levels of classroom university teaching and blended training courses.

Social knowledge network of the Universidad Internacional Menéndez Pelayo (UIMP), Spain
http://redsocial.uimp20.es/

The UIMP 2.0 Project combines traditional classroom-based classes with the creation of a social content network through which students and teachers can interact and share knowledge and ideas, whilst also opening a new window into society through science.

For further reading

We recommend the following articles and resources for those who would like to find out more about social media.

Learning in Participative Culture: A Conversation on New Media and Education (first part)
http://henryjenkins.org/2010/02/_children_and_young_people.html

(Henry Jenkins, henryjenkins.org, 8 February 2010) Henry Jenkins is interviewed on the impact of new media on society.

Examples of social media in universities
http://comunicacionsellamaeljuego.com/ejemplos-de-social-media-en-universidades/

Blog by Pablo Herreros, 2010. A presentation which compiles some Spanish and international examples of the application of social media in the university field.

Open social learning **and its potential to change the contexts of higher education in Spain**
http://hdl.handle.net/10609/2062

UNESCO e-learning Chair - eLearn Center, Open University of Catalonia. 2010. A report on the status of OSL in Spain, the result of the working session on *Open Social Learning.*

The use of blogs among journalism lecturers in Spain
http://www.icono14.net/revista/num14/05_icono14_davidparra.pdf

David Parra Valcarce. *Icono magazine,* 14, 2009. Based on the analysis of some specific experiences, this article examines how a growing number of lecturers who teach journalism in Spanish universities are committing to technology such as blogs in order to disseminate their pedagogical experiences and know-how.

New forms of communication: cyber media and mobile media
http://www.revistacomunicar.com/index.php?contenido=revista&numero=33

Comunicar magazine, 33, March 2009. A special issue devoted to experiences of innovation and research into the use of digital social media.

Reader on web 2.0 and Education
http://ictlogy.net/bibciter/reports/bibliographies.php?idb=27

2009. A bibliographical compilation of reading of interest on web 2.0 and its applications in education. It includes works with a practical application as well as others with a more theoretical focus.

Delicious: Social media
http://delicious.com/tag/hz10ib+socialmedia

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add to this list, simply tag the resources with “hz10ib” and “socialmedia” and save in Delicious

OPEN CONTENT

Time-to-Adoption: from two to three years

In Ibero-America, there are two main aspects to the trend towards open content. Firstly, it reflects a change in the way in which academic institutions conceptualize learning as something that has more to do with the production of knowledge than with the transmission of information in their courses. On the other hand, however, the fact that the adoption horizon is within two to three years - as opposed to a near-term one - is justified by the needs and special situation of countries in Ibero-America vis-à-vis other parts of the world. The advent of ICT has been slow, especially insofar as concerns broadband connectivity. Language too, unlike the hegemonic English, has been a barrier to the rapid adoption of open content. At first sight then, it would appear that cutting costs and net increases in content in local languages will foster the adoption of open content in universities.

Overview

Open content is seen – throughout the world of education but also in political and economic spheres – as an opportunity to access information and knowledge that are already on the Internet both quickly and cheaply. Given that the information society is access to knowledge as well as technology, open content can be used to "leapfrog" a stage to obtain direct access to that knowledge. This democratization of content and the possibilities it brings is clearly what makes this trend most relevant in the region, which sees open content as an opportunity to obtain textbooks and educational materials in a flexible and cost-effective way.

This argument is particularly relevant for Ibero-America. Despite the major progress made in recent years, the growing but slow adoption of information and communication technologies in Ibero-America is leaving the region trailing behind somewhat in the information society. What is more, this delay does not occur in isolation; rather, it is worsening – and indeed is also a result of – the region's delayed economic development in comparison to the higher-income countries of the world, particularly in certain areas, which serves to intensify the inequalities in access.

Many open content initiatives have been proposed from all areas of society. The university community has come together under the Fundación Universia (http://www.fundacionuniversia.net/) to create OpenCourseWare Universia (http://ocw.universia.net/), a project that emulates the OpenCourseWare Initiative (http://ocw.mit.edu) of the Massachusetts Institute of Technology. It has brought together more than 100 higher-education institutions in Ibero-America to share open educational materials and make them available to the education community for their reuse, transformation and redistribution. Many universities have also made their individual scientific and teaching production available to the community. Some of these, such as the Universidad Nacional Autónoma de México and the Mediacampus of its Coordinadora de Universidad Abierta y Educación a Distancia (http://mediacampus.cuaed.unam.mx/), have taken a step beyond the text medium with a file containing hundreds of video, sound and image files. Lastly, civil society also participates in the creation and dissemination of open educational content, as is the case of Encicloabierta (http://www.encicloabierta.org), which has a unified catalogue of educational resources to assist with finding, reusing and publishing open content.

All these initiatives are a unique opportunity both for disseminating a region's own content in its own language and for bringing foreign content into its specific context, adapting and translating it for the iberoamerican context ("locating" as it is known technically).

Outside formal or institutional environments, the use of online office suites such as Google Documents (http://docs.google.com) and the intensive use of wikis allow for the quick and easy use of collaborative tools to create open content. Some of the more interesting examples of these are Wikilearning (http://www.wikilearning.com/), the IES Gran Capitán wiki (Spain), with a catalogue of ICT resources applied to education (http://www.iesgrancapitan.org/mediawiki), and Eduwikis, of the Instituto de Tecnologías Educativas (Ministry of Education, Spain) (http://recursostic.educacion.es/observatorio/apls/wikiseneducacion/).

Relevance for teaching, learning or creative inquiry

First and foremost, open educational resources means that the content is freely available to anyone with Internet access. This results in a huge potential increase in access to knowledge in multiple formats, which, by extension, could increase access to education, especially in geographically isolated or economically depressed areas where educational facilities are poor or non-existent.

On this point, there is a growing number of open information repositories in educational institutions throughout Ibero-America, ranging from classroom materials to complete courses. This is making an expanding set of resources available to the entire region of Ibero-America, often with materials of a high technical and educational quality with the potential to become benchmarks. Surprisingly, however, despite the increasing availability of educational resources, their usage is remarkably low. This suggests that there is a need to implement strategies to effectively integrate the use of these materials in the everyday practice of teachers and students while improving the visibility of the resources available.

Open content also allows teachers to customize their courses quickly and at no cost, while keeping abreast of emerging information and new ideas at the same time. The possibility of accessing open content is merely an indirect – albeit very efficient – way of continuously updating knowledge, both of content and of teaching methodologies, especially the more innovative of these.

Lastly, open content allows specialists of all kinds to come together in the educational environment, including teachers from non-formal educational contexts. Hence, practical communities and groups of students formed around open content also provide a source of support for independent and lifelong learning.

A sampling of applications of open content in different disciplines includes the following:

- **Art.** EducaThyssen is the name of the Internet portal of the Research and Educational Outreach Section of the Thyssen-Bornemisza Museum (Spain). It offers a range of open educational resources, including a repository of text and image materials, an educational video channel and a blog (http://www.educathyssen.org/).
- **Postgraduate studies.** EAFIT University (Medellín, Colombia) offers an open postgraduate course as part of its Master's in engineering program (http://gryc09.pbworks.com/). The Universidad de La Sabana (Bogotá, Colombia) also offers an open postgraduate course that explores the present and future of eLearning (http://elrn09.pbworks.com/). These courses can be taken in the traditional way or as open courses, with access not only to all materials, but to the learning experience too.
- **Mathematics.** Experiencia Didáctica en el Aula (EDA, Teaching Experience in the Classroom) is a series of projects for interactive mathematics teaching by Spain's Ministry of Education. The project has a repository of open educational materials for the later years of primary education and the whole of secondary (Descartes), interactive software for teaching mathematics in school (GeoGebra), a creative software tool for the creation and implementation of multimedia teaching units (MALTED) and an open workshop for the creation of interactive resources for physics teaching in secondary school and sixth form (Newton) (http://recursostic.educacion.es/eda/).
- **Scholarly production.** The Facultad Latinoamericana de Ciencias Sociales (FLACSO) in Mexico has created an open knowledge repository with open access to the scholarly production and research work of faculty staff and students. The platform can be browsed by subject, topic or region, and incorporates an intelligent system that suggests works of possible interest to readers (http://conocimientoabierto.flacso.edu.mx).

Open content in practice

The following links provide examples of open content.

Agrega

http://www.proyectoagrega.es/

The Agrega project of the Spanish Ministry of Education allows any type of open content to be shared across the entire education community, including families and producers, two groups often excluded from the dynamics of open educational content. Besides the usual storage, search and reuse features, Agrega allows users to manage their own account, which includes the option of creating their own and collaborative content.

LACLO

http://www.laclo.espol.edu.ec/

The Latin-American Community of Learning Objects (LACLO) is a network of researchers, developers, teachers and individuals and institutions in general, interested in implementing technologies related to learning objects in Latin America's education sector. LACLO is a member of the global network of learning object repositories (GLOBE).

CAB-IB Institutional Digital Repository

http://ricabib.cab.cnea.gov.ar

RICABIB follows in the wake of other initiatives with the aim of unifying on a single platform all production taking place in the university context, whether teaching or research. Powered by the Instituto Balseiro and Centro Atómico Bariloche, Argentina, it provides access to articles, books, theses, photos, videos, class notes, exercises and exams.

Temoa. Open Educational Resources Portal

http://www.temoa.info/es/node/23646

The Tecnológico de Monterrey (Mexico) promotes this portal through the Centre for Innovation in Technology and Education (Innov@TE). It is a database providing a public, multilingual catalogue of collections of open educational resources (OER) that seeks to support the education community in finding resources and materials to meet their teaching and learning needs through a collaborative system of specialized searching and social tools.

UNESC0 OER Community

http://oerwiki.iiep-unesco.org/

Wiki page of the international working group on open educational resources promoted by UNESCO's International Institute for Educational Planning. It includes all sorts of useful information for beginners and those seeking to learn more about the knowledge and application of open content: directories, examples, "toolbox" to create content and house it in repositories, etc. It includes the Open Educational Resources document: "El camino adelante" ("The Road Ahead").

UOC OpenCourseWare

http://ocw.uoc.edu

Website offering its teaching materials through the Universitat Oberta de Catalunya to the Internet community: teachers, students and self-learners. It is embedded within UOC O2 (http://openaccess.uoc.edu), the university's institutional repository, which contains more than 1,300 documents, mostly educational, but also for research and institutional purposes.

For further reading

The following articles and resources are recommended for those who wish to learn more about open content.

Center for Social Media Publishes New Code of Best Practices in OCW

http://criticalcommons.org/blog/content/center-for-social-media-publishes-new-code-of-best-practices-in-ocw

Critical Commons, 25 October 2009. The Critical Commons pressure group seeks to promote the use of multimedia elements in open learning resources. Its Code of Best Practices in Fair Use for OpenCourseWare is a guide for content developers who wish to include fair-use material in their offers.

Flat World Knowledge: A Disruptive Business Model

http://industry.bnet.com/media/10003790/flat-world-knowledge-a-disruptive-business-model/

David Weir, BNET, 20 August 2009. Flat World Knowledge is enjoying rapid growth, from 1,000 students in the spring of 2009 to 40,000 in the autumn term using their materials. The company's business model pays a higher royalty percentage to textbook authors and charges students a great deal less than traditional publishers.

"La iniciativa Knowledge Hub: un aporte del Tecnológico de Monterrey al mundo"

http://www.utpl.edu.ec/ried/images/pdfs/vol12N2/iniciativaknowledge.pdf

Fernando Jorge Mortera and José Guadalupe Escamilla de los Santos. RIED, *Revista Iberoamericana de Educación a Distancia,* 12. 2009. This article describes the technological and educational development and implementation of the Knowledge Hub initiative of Tecnológico de Monterrey. It discusses the specific features of this search engine for open educational resources, its technical aspects and the stages of its development. It also presents the results of research on the use and experiences of teachers in the management and incorporation

of educational resources from the Knowledge Hub to their courses.

Office of Knowledge Dissemination of the Universitat de Barcelona

http://www.bib.ub.edu/es/servicios/odc/

The Office of Knowledge Dissemination provides an information and advisory service to members of the Universitat de Barcelona on everything related to the dissemination of the scientific knowledge generated, and on the use of external materials, placing particular emphasis on open release alternatives.

Office of Open Knowledge of the Universidad de Salamanca

http://oca.usal.es/

The Office of Open Knowledge is the structure created by the Universidad de Salamanca (Spain) to promote the Open movement within the university. Its works on lines such as the open dissemination of teaching materials, the definition and application of open standard policies for the transmission and communication of information in the USAL (University of Salamanca), the free dissemination of scientific research and the use of free software.

Reader on Open Access for Development

http://ictlogy.net/bibciter/reports/bibliographies.php?idb=20

Ismael Peña-López, last updated: 8 June 2010. Bibliography on the paradigm of open knowledge and its impact on and application in development.

Delicious: Open Content

http://delicious.com/tag/hz10ib+opened

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add to this list, simply tag resources with “hz10ib” and “opened” when you save them to Delicious.

MOBILES

Time-to-Adoption: from two to three years

In many areas of the world, mobile computing is becoming an increasingly indispensable part of daily life. One of the clear determining factors behind this phenomenon is the increasing ease and speed with which Internet can be accessed thanks to mobile phone networks and wireless connections. An analysis of recent telecommunications market reports for the iberoamerican area shows a similar trend. Furthermore, a whole range of mobile devices (phones, smartphones, *PDAs, Tablet PCs,* e-readers, netbooks, *etc.) run applications which enable a wide range of tasks to be carried out and facilitate access to services available on the Net which are being extended every day and mostly offer free access. Some of these devices have already penetrated all social levels in Latin America, with a very high average density. This reality extends and renews the possibilities of immediate access to all sorts of information anywhere, allowing us to come up with more flexible, contextualized and innovative teaching designs that transform traditional teaching and learning methods.*

Overview

The mobile technology industry has continued to grow in recent years and the constant innovations in the development of new devices and applications are constantly taking us by surprise with the launch of increasingly sophisticated, complete and finely-tuned products. This rate of production is accompanied by rapid growth in sales and consumption, with nearly 4 billion subscribers, more than two thirds of whom live in developing countries.

This means that a massive number of people – increasing worldwide – use small computers that provide wireless Internet access any time, anywhere. These devices support applications designed to perform a wide range of tasks and to facilitate the use of a number of services that are increasing by the day, most of which are free: from routine e-mail, calendars and schedules to tools for video/audio capture and basic editing, personal organizers such as Nozbe (http://www.nozbe.com/) and Tripit (http://www.tripit.com/), note-making tools like Evernote (http://www.evernote.com/) tools for detecting and measuring, geo-location, access to shared files such as Dropbox (www.dropbox.com) and Calengoo (http://calengoo.dgunia.de/), blog publishing like Tumblr (http://www.tumblr.com/), social networks... In short, they can be used to check and update personal information flows easily and immediately, almost as though from a computer desktop.

The term "mobile device" is generally used to describe pocket-sized products of the size of a mobile telephone; this includes both standard phones – for calls and text messaging services – and smartphones and other devices such as PDAs. In the broader sense, mobile devices also encompass ultra-slim devices such as slates, pads and netbooks, etc., which can run most typical applications despite their very compact design. There is a third type of more specialized devices, designed for specific purposes: e-books, such as Kindle, e-mail readers like Peek, and Flip camcorders. Obviously, the degree of effective mobility of each of these products differs, and this determines the type of mobile applications they offer.

Mobile devices can be used to come up with innovative teaching designs to transform the traditional processes of teaching and learning. To achieve this, we will need to promote lines of research that explore the possibilities of application through pilot projects based on the selective use of these devices under different conditions and in different disciplines, in order to subsequently define what should be learned and in what way through mobiles based on user profiles and the needs of each context. Studying the uses associated with informal learning by young people or "advanced" users can be very enlightening in this respect.

Relevance for teaching, learning or creative inquiry

The expectations generated by *mLearning* in the higher-education context of Ibero-America are very high. The fact that almost every student has a personal mobile phone by secondary school makes this the natural choice for the distribution and storage of content and reference material, but also for interactive activities and even for data collection and fieldwork.

This means that academic institutions are starting to think in terms of ubiquitous mobile campuses based

on wireless networks. Distance universities based on *eLearning* systems are also incorporating these technologies. In these cases, the purpose of the mobile devices is not to replace other technological means but to complement the existing ones in order to offer a more customized and flexible learning experience, allowing students to choose the device, place and time that fits in best with their lifestyle, and to offer a more contextualized and rooted experience through the design of consistent educational situations adapted to their context and educational interests.

Some iberoamerican universities, like other organizations and companies, are beginning to design courses and content which are interoperable on different platforms and channels, adapted for mobile devices. In this context, it is imperative that the standards of development are chosen taking into account the characteristics of the different products available, to ensure that they do not exclude users with more basic devices. For example, the MobilEd project (http://mobiled.uiah.fi/), developed in South Africa and Finland, allows Wikipedia searching on more basic mobile devices through straightforward text messaging and the Mediawiki platform.

Students can use mobiles to conduct relevant fieldwork outside the classroom, that is, by taking advantage of their location at any time to take readings, gather information and exchange data and results, not unlike the method used by research teams. In such situations, mobiles can be used with barely any intrusion for functions as diverse as taking photos, making voice, text or video recordings of observations, playing sound, sending and receiving multimedia messages, accessing reference sources in real time and organizing them. The possibility of going back to these records to share and analyze them and to reflect on them with a view to improving or drawing conclusions from them undoubtedly contributes to the development and consolidation of "twenty-first century skills" (creative and critical thinking, problem solving, teamwork, information management, etc). In creative inquiry, in fields as diverse as biology, communication, sociology, anthropology, etc., there are numerous possibilities.

The interaction between students and teachers is another of the uses on which many expectations hinge. The teacher can easily and continuously collect relevant information on student activity in order to make teaching assessments. This monitoring and tutoring, which can be carried out through simple text messages, may be useful in helping students to redirect and self-manage their learning process. For their part, students can receive information on their qualifications or examination dates, or instructions on activities; they can also hand in work, ask and obtain answers to questions in time, etc. This is a similar approach to just-in-time learning, which is widespread in the corporate training sector.

A sampling of mobile learning projects developed in different disciplines includes the following:

- **Language learning.** The Spanish Ministry of Industry, Trade and Tourism has launched the Español a la Carta (Spanish à la carte) training program for Spanish learning. The initiative, which involves the development and use of multimedia training content for mobile devices, is addressed to the immigrant community working in the hospitality and tourism industries (http://www.mobile-in.es/index.php).
- **Libraries.** The Dr. Jorge Villalobos Padilla, SJ library of ITESO, the Universidad Jesuita de Guadalajara (Mexico), makes the EBSCO-MOBILE system available to its users. This system allows articles to be searched and downloaded in PDF format via mobile devices, either to be read on the devices themselves or to be sent to the user's personal e-mail account (http://biblio.iteso.mx/biblioteca/).
- **Mathematics.** The Virtual Reality Research Laboratory of Universidad EAFIT in Colombia has explored the use of a virtual collaborative environment on tablet PCs and PDAs as a means of support in multivariable calculus classes, both in a single space and distributed across a number of spaces. The interface can display equations and geometric elements that students can manipulate for ease of understanding, both individually and collaboratively.
- **Telemedicine.** In the project for Continuing Medical Education for Health Care Workers in Developing Countries, health care workers from different clinics in Peru can update and share their knowledge from the workplace in remote areas of the country by means of a training web platform accessible from mobile devices (http://www.slideshare.net/ignatia/mobile-continuing-medical-education-for-health-care-workers-in-developing-countries).

Mobiles in practice

The following links provide examples of the use of mobile devices.

Moodle4Iphone Project

http://www.youtube.com/user/moodle4iPhone#p/a/f/1/ZlWiLr8of48

An international group of researchers formed by experts from the Institute of Tropical Medicine in Antwerp (Belgium) and the Alexander von Humboldt Institute in Lima (Peru) have developed a learning application under a Creative Commons GNU licence for connecting to the open-source learning platform Moodle via mobile devices such as the iPhone and the iPod.

Ceibal Plan of Uruguay

http://www.ceibal.edu.uy/
http://ceibal.org.uy/

The Ceibal Plan (Conectividad educativa de informática básica para el aprendizaje en línea or Educational connectivity of basic information for eLearning) is a socio-educational project developed jointly by the Ministerio de Educación y Cultura (MEC), the Laboratorio Tecnológico de Uruguay (LATU), the Administración Nacional de Telecomunicaciones (ANTEL) and the Asociación Nacional de Educación Pública (ANEP). The aim of the project is to provide all children enrolled in primary schools in Uruguay with a portable mini-computer with wireless Internet connection.

Mobile learning project of the Tecnológico de Monterrey

http://www.ccm.itesm.mx/tecmovil/

This project was launched in 2008 with the aim of providing students of a range of subjects with a training offer based on the use of mobile multimedia devices and a broadband connection to the Internet. Its purpose is to expand the possibilities of interaction and communication in the various processes of distance education by allowing flexibility in time, space and movement.

Campus Móvil (Mobile Campus) project

http://www.campusmovil.net/inicio.php

This is an online application that uses mobile devices to provide access to a social network formed by iberoamerican universities. Students and teachers can access news, consume, organize and share all manner of files in multiple formats, plan tasks as a group, and produce information that can be retrieved and reused on other platforms.

Mobile Learning project of the Escuela de Organización Industrial (EOI)

http://www.eoi.es/blogs/mlearning/

Blog maintained by Tíscar Lara. All students of post-graduate and master's programs at the EOI during the 2009-2010 academic year have a free HTC 3G smartphone with the Android operating system installed for use as a tool for learning and communication. It was designed as an active research project, in which the mobile device is a social learning tool to which continuous improvements will be made based on the experience of its users.

My way and ¡Elige! projects of the Universitat Oberta de Catalunya

http://myway.blogs.uoc.edu/

The Office of Learning Technologies at UOC has developed a system for adapting educational materials to make them accessible and fully compatible with any device. In this system, a base document is used to obtain the output format required by the student: audio, web, PDF, Daisy (the system used by visually impaired) or Q-mobile.

For further reading

The following articles and resources are recommended for those who wish to find out more about mobile devices.

Desarrollo de habilidades cognitivas con aprendizaje móvil: un estudio de casos (development of cognitive skills with mobile learning: a case studies)

http://www.revistacomunicar.com/index.php?contenido=detalles&numero=34&articulo=34-2010-23

Ramos Elizondo, A. I.; Herrera Bernal, J. A., and Ramírez Montoya, M.S. *Comunicar,* 34, 2010. The article presents a multiple case study on the large-scale implementation of a mobile learning project. The findings of the research suggest that *mLearning* resources and the use of mobile devices encourage the development of cognitive skills such as problem solving, decision making, critical thinking and creative thinking.

New technologies, new pedagogies: Mobile learning in higher education

http://ro.uow.edu.au/edupapers/91/

Herrington, J.; Herrington, A.; Mantei, J.; Olney, I., and Ferry, B. Faculty of Education, University of Wollongong, 2009. *E-book* that includes a

compendium of good practices of *mLearning* in higher education, developed in various subjects at the Faculty of Education.

Mobile Learning Resources
http://www.educause.edu/Resources/Browse/MobileLearning/17505

Collection of publications, presentations, podcasts and blogs on mobile learning by EDUCAUSE.

Sistema de apoyo a la evaluación del aprendizaje sobre dispositivos móviles (support system to the evaluation of learning with mobile devices)
http://www.acis.org.co/fileadmin/Revista_113/siete.pdf

Pedraza Amaya, M. L., and Reina Garzón; D. A. *Revista de la Asociación Colombiana de Ingenieros de Sistemas,* 113. May 2010. The article describes the design and construction of an information system mediated by mobile devices that allows the participation and interaction of teachers and students in continuous assessments and training processes.

Una sociedad en movilidad: nuevas fronteras (A society on the move: new frontiers)
http://sociedadinformacion.fundacion.telefonica.com/DYC/TELOSonline/REVISTA/Dossier/seccion=1212&idioma=es_ES.do

Dossier by the journal *Telos. Cuadernos de Comunicación e Innovación,* 83, May 2010. The analytical inputs from the fourteen specialists writing in this dossier include aspects of society on the move.

Web 2.0: dispositivos Móviles y abiertos para el aprendizaje (Web 2.0: movile and open devices for learning)
http://www.utpl.edu.ec/ried/images/pdfs/vol12N2/recursostecnologicos.pdf

Monográfico *Revista Iberoamericana de Educación a Distancia,* 12 (2), December 2009. This monograph brings together contributions from different authors and institutions focusing on the application of technological resources for mobile learning in distance education and multi-mode environments.

Delicious: Mobile
http://delicious.com/tag/hz10ib+mobile

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add to this list, simply tag resources with “hz10ib” and “mobile” when you save them to Delicious.

AUGMENTED REALITY

Time-to-Adoption: from four to five years

What was until recently experimental technology, restricted to the field of expert technicians and researchers, is becoming increasingly accessible. Today, various devices already available for a sector of the iberoamerican population and with a trend towards greater penetration (mobiles, video game consoles, PDAs, tablet PCs, etc.) are equipped with the tools necessary to implement augmented reality. This technology is seen in higher education in Ibero-America as a trend capable of making significant changes in the way that students of different disciplines perceive and access the physical reality, understood as spaces, processes or objects, thus providing richer and more immersive learning experiences. Augmented reality can facilitate the understanding of complex phenomena, making it possible to see the environment and individual objects from different angles, with a view which is more comprehensive, richer and detailed, as well as being complemented by additional digital data.

Overview

Augmented reality, understood as a real-time projection of digital information layers on the images that we see in the physical environment, is neither conceptually nor technologically new. Augmented reality systems generate new images by adding digital information in real time to a person's field of vision. Thus, AR integrates the signals received from the physical world (typically video and audio) into information created digitally (multimedia objects, three-dimensional graphics, textual data, etc.) and matches them up to build new, coherent, integrated and enriched environments. At present, several devices already available to a broad sector of the population with a tendency towards increased market penetration (mobile phones, game consoles, PDAs and tablet PCs) now have the necessary tools to implement augmented reality. The first applications for mobile appeared in 2008 and there are now several social and augmented reality mapping tools on the market.

What until recently was an experimental technology restricted to the context of technical experts and researchers is becoming increasingly accessible both for developers and a large segment of consumers. A short time ago, Time magazine named it as one of the top ten technology trends for 2010. Time magazine actually puts it in fourth place although, interestingly, many of the technologies that figure in the ranking use augmented reality themselves: geo-location, cloud computing, social gaming and objects, etc. Gartner Research identified augmented reality as one of the ten most disruptive technologies during the period 2008-2012, estimating an usage among mobile users of 30% by 2014.

Wireless mobile devices are increasingly used as effective interfaces of augmented reality systems. The integrated camera and display on smartphones can capture large visual fields, which are edited with other devices to insert digital objects and combine them with real-world data. Augmented reality applications can be based on markers or symbols that the software interprets through a specific cue. There are also markerless applications, which use positional data obtained from a mobile GPS and compass for instance, or from image recognition systems based on comparing what is captured on camera with an image library. Any of these applications can be used to accurately pinpoint where the phone's camera is pointing and to overlay relevant information on the appropriate points of the screen. Markerless applications are also more versatile because they work anywhere without the need for special labeling or supplemental reference points.

Layar (http://layar.com) is one of the first augmented reality applications for Android mobile phones and iPhones. Layar's mobile application contains layers of content, which may include ratings, reviews, advertising, etc. developed freely by millions of developers at this time. Wikitude, another example, overlays information from Wikipedia and other sources on to a real world view. Tagwhat (http://www.tagwhat.com/) allows users to create their own AR content, and to geolocate and share it with people all over the world, quickly, easily and free of charge. This application also allows integration with Twitter, Facebook, YouTube and Google Maps. O Zugstar, an online video conferencing system developed by Zugara (http://zugara.com/), allows users to share an augmented reality experience.

Use of the term "augmented" is justified because the technology amplifies human capabilities of perception, breaking down the physical reality into

its various dimensions to facilitate the uptake of certain components that are not always perceptible to the senses, thus generating models that simplify the multidimensional complexity of the world. Hence, the most promising type of applications are those designed to reformulate the information on the reality with multidimensional data that have been segmented and refined to suit the criteria of the users.

Relevance for teaching, learning or creative inquiry

Augmented reality has the potential in education to be a technology capable of making major changes to the way students of different disciplines perceive and access the physical reality, understood as spaces, processes or objects, thus providing richer and more immersive learning experiences.

It represents a qualitative leap in the way that educational content is understood, since it provides new ways of interacting with what is real (physical) through digital information layers that expand on, complement and, to an extent, transform the original information. Conversely, it is also possible to involve physical objects in a virtual environment. The application possibilities associated with the development of teaching materials and learning activities are many, direct and easy to imagine in virtually all disciplines, especially those related to applied sciences (engineering, chemistry and physics, biology), but also in industrial design, surgery, archaeology, museology, etc. In the mid-term, this technology could be used both in the classroom and in distance education, in technology development projects, for instance, which require the development of certain skills. One example is the prototypes designed at the Universidad Abierta y a Distancia of Mexico, through which the time physically spent in laboratories can be optimized.

Augmented reality can aid understanding of complex phenomena, offering an enriched and more comprehensive view of the environment and objects from different angles, detailed and supplemented by extra data. The connection and integration of information from different sources can lead to more interdisciplinary approaches to the objects of study, through simulation or case analysis, for example, which will allow students to adopt a more comprehensive and holistic view of the content. These environments can facilitate the exploration and discovery of relationships between processes and phenomena, as well as the interconnected nature of knowledge about the world, often concealed behind the arbitrary divisions we make between different subjects or areas.

Another of the big potentials of augmented reality is that of providing learning experiences outside the classroom, more in context. These would bridge the gap between the reality and the learning situation in which the students are taking part. Any physical place can be transformed into a stimulating learning scenario based on the real world, hence providing more meaningful learning experiences. In historical locations, for example, students of archaeology, history and anthropology can access applications that rebuild the location at different points in the past, using maps, charts and other information. Museums can also become interactive and extremely immersive spaces of self-learning. On this point, we can cite a number of initiatives being developed by universities in Spain, such as Pompeu Fabra and Rovira i Virgili, in Catalonia. For its part, the Futurelab group of the Universidad Politécnica de Valencia has developed an augmented reality prototype that allows access to virtual reconstructions of emblematic monuments and to capture these images on PDA devices, mobile phones and computers.

The application of AR to fields such as archaeology could allow us, for example, to walk through remains and see their original condition in three dimensions. Moreover, in contrast to virtual reality, augmented reality provides an opportunity to be part of the phenomenon, environment or object under study, to venture inside the reality that recreates it.

Augmented reality can also be used to model 3D objects on physical planes and to analyze the composition of such objects. The model created in 3D is shown on an image that the software takes as its "anchor". The animated model can then be manipulated and controlled using the keyboard or mouse, making it possible to interact with it. This way, students can view an object in different scenarios and receive an immediate visual response to their designs and ideas, allowing them to detect anomalies or problems that need to be solved. An example of such practices is Mauricio De Nassau college in Brazil, where architecture students use AR to project scale models of buildings, cutting down on the time spent constructing and presenting architectural proposals.

Augmented books and gaming are another interesting application of this technology. With books, objects can be viewed in augmented reality simply by installing

a special program on the computer and pointing a webcam at the book.

Given the potential impact of augmented reality on different disciplines and professional profiles, the approach of higher education must go beyond the creation of environments and educational resources. It requires innovating in the offer and syllabus, while also opening up a new field of exploration in several areas of applied research. The potential of this technology for higher education is still largely undiscovered and depends more than on our ability to imagine and develop it as teaching applications than on the possibilities of the technology itself.

A sampling of applications of augmented reality in different disciplines and fields of higher education includes the following:

- **Architecture.** As part of an academic experience, the Faculty of Architecture and Urban Planning of the Universidad de Chile has implemented an AR system to visualize architectural projects submitted by students in order to show them to the public in a collaborative online workshop that allows for synchronous telepresence (http://cumincades.scix.net/data/works/att/sigradi2008_161.content.pdf).
- **Technical drawing.** There are several initiatives among iberoamerican universities that use Google SketchUp in combination with the AR-media plug-in to design pieces and convert them to 3D with AR (http://www.inglobetechnologies.com/en/products/arplugin_su/info.php/http://www.youtube.com/watch?v=tuVvC0wD52U&feature=related).
- **Engineering laboratories.** The Engineering College of Bilbao EHU, of the Universidad del País Vasco, has worked on applying AR in engineering subject labs. In these laboratories, students can experiment with real electrical and mechanical devices such as electrical machines, electronic circuits, scale models, pneumatic actuators, motors, etc.
- **Mathematics.** Universidad EAFIT in Colombia uses AR to teach multivariable calculus in combination with educational approaches of teaching for understanding, with a view to fostering student comprehension of the concepts of this area.

Augmented Reality in practice

The following links provide examples of the use of augmented reality.

EDRA project

http://www.proyectoedra.cl/
http://www.reflejados.cl/proyecto-edra-realidad-aumentada-made-in-chile/

The EDRA project (Espejismo Digital Realidad Aumentada or Augmented Reality Digital Mirage) is an augmented reality experiment conducted by graphic design students at the Universidad de Chile. Its aim is to incorporate augmented reality into various projects in order to enrich educational approaches to entertainment, commerce and/or advertising, where user interaction with the medium leads to its full appropriation.

Prisma project

http://www.realidadaumentada.es/6C7E8BEA-C113-442F-BF0D-D9E2F9BE4CD0.html

Prisma is a research project launched to develop and implement a new three-dimensional display system based on augmented reality and interactive digital narratives applied to tourist and cultural environments.

RASMAP project

http://www.labein.es/rasmap-w.nsf/descripcion.html

The RASMAP project of the EHU Multimedia Group of the Universidad del País Vasco (http://bit.ly/cBuynJ) was launched to develop a platform to facilitate the development of mobile personal assistants (Wearable Personal Assistant). Two demos were developed to validate the prototype, one in the field of heritage, as a visitors' guide, and a second in mechanical engineering, as an assistant for distance learning.

Realitat3 project

http://www.youtube.com/watch?v=B9U2RDe-N9Q

This project is being conducted by the LabHuman-I3BH research group (http://www.labhuman.com/) of the Universidad Politécnica de Valencia and the Department for Education (Spain). It involves the use of children's textbooks with augmented reality in primary schools.

Usando realidade aumentada em um sistema de Percepção 3d para deficientes visuais (Using augmented reality in a 3D perception system for visually impaired)

http://www.planetaeducacao.com.br/portal/imagens/artigos/aprenderdiferencas/TesepostarRSW%20tese%20RA.pdf

Wataya, R.; Valente, J.; Kirner, C., and Kirner T. 2009. Researchers from three universities in Brazil (Universidade Adventista de São Paulo – UNASP, Universidade Estadual de Campinas – UNICAMP, Universidade Federal de Itajubá – UNIFEI) have developed a 3D perception and simulation environment that uses AR for the education of people with special visual needs.

For further reading

The following articles and resources are recommended for those who wish to learn more about augmented reality.

10 Cool Things Going on Right Now in Augmented Reality

http://gamesalfresco.com/2010/05/03/10-cool-things-going-on-right-now-in-augmented-reality/

Gamesalfresco.com, May 2010. Rundown of ten different projects and current uses of AR.

Descending Clouds - Society and Augmented Reality 101

http://www.personalizemedia.com/descending-clouds-society-and-augmented-reality-101/

Personalizemedia, April 2010. Collection of videos on the latest developments in AR.

Forum of Innovation on Augmented Reality

http://www.innovauoc.org/foruminnovacio/2010/02/video-10e-forum-dinnovacio-realitat-augmentada

February 2010. Content of the Forum of Innovation on AR hosted by the Open Innovation Office of the Universitat Oberta de Catalunya.

La realidad aumentada ya está aquí

http://sociedadinformacion.fundacion.telefonica.com/DYC/SHI/Articulos_A_Fondo_-__La_realidad_aumentada_ya_esta_aqui/seccion=1188&idioma=es_ES&id=2009120314550001&activo=4.do

Salvador Pérez Crespo, from Telefónica I+D. Articles on the information society. Fundación Telefónica. This work looks at the technological dimension of AR, offering some examples and outlining the development of challenges that could revolutionize the field of application of AR.

Realidade virtual e aumentada: Conceitos, Projeto e aplicações (Virtaul reality augmented: concepts, project and applications)

http://www.ckirner.com/download/livros/Livro-RVA2007-1-28.pdf

Claudio Kirner and Robson Siscoutto (eds.), Rio de Janeiro (Brazil), May 2007. Compilation of presentations made at the pre-symposium of the Ninth Symposium on Virtual and Augmented Reality.

TOP 10: Lo mejor de la Realidad Aumentada (TOP 10: The best of Augmented Reality)

http://www.neoteo.com/top-10-lo-mejor-de-la-realidad-aumentada.neo

Neoteo.com, September 2009. Article offering a number of examples of augmented reality considered to be among the most interesting. Some are complex, but others can be reproduced on phones and computers with a simple webcam, proving that this technology continues to mature and develop.

Delicious: Augmented Reality

http://delicious.com/tag/hz10ib+augmentedreality

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add to this list, simply tag resources with “hz10ib” and “augmentedreality” when you save them to Delicious.

SEMANTIC WEB

Time-to-Adoption: from four to five years

The basic idea of the semantic web is that while online data are available for searching, their meaning is not: computers are very good at detecting words but very poor when it comes to understanding the context in which keywords are used. The as yet nascent - albeit promising - developments in the semantic web are allowing the contents of this context to be furnished. This makes it possible for information searches to be more precise and, above all, for the results to be much more valuable and relevant. The specification of tacit knowledge is also made easier, an application which is particularly useful when recovering dispersed knowledge generated outside traditional knowledge sources. The information recovered is also not only of a higher quality, but is also easier to be reused in diverse applications other than the purpose for which it was produced. The semantic web is thus often the engine behind other technologies, such as augmented reality, mobility and geolocation tools or social media.

Overview

In general, the semantic web is still a concept under development and is far from an applied reality. However, its close ties with many other points addressed in this report, both directly and indirectly, and its special nature as a technology composed of many different ones has earned it a place here, even though its horizon may be more distant and despite the fact that it may seem impulsive to some authors and scholars of the subject around the world.

The semantic web is associated with the Web of the future, "Web 3.0"; a new stage that will add meaning to the Web, making it capable of interpreting and connecting more data through the inclusion of semantic content and the use of artificial intelligence techniques. However, the development of the Web in recent years appears to show that Web 3.0 combines many other roads with that of semantics: 3D web, geospatial web, intelligent web, pervasive web, web centered on multimedia objects, etc.

The semantic web is nothing more than a way of harnessing the massive amounts of data on the Internet in order to generate meaning from them. In this sense, the semantic web often involves boosting the efforts made over the years in areas such as the creation of open content for learning, management of personal and collective knowledge, the construction of personal learning environments (PLE), the use of mobile technologies that provide data on geo-positioning, the mass convergence of people and institutions on social networking platforms and, of course, the giant leap set to be made with augmented reality and the "Internet of Things" based, among other aspects, on labeling with RFID (radio-frequency identification).

The effort invested in feeding data to the Internet has been, is and will continue to be very significant, though no more so than the retrieval of this data, i.e. searching based on semantic data. The semantic search is changing the way we search for and, increasingly, find information in large silos of data on the Web. With advancements in semantics-sensitive computing, some "smart" search engines have seen the light, including WolframlAlpha (http://www.wolframalpha.com) TrueKnowledge (http://trueknowledge.com), Hakia (http://www.hakia.com), Powerset (http://www.powerset.com) and Kngine (http://kngine.com/), all of which are beginning to respond to questions in the natural language of humans. These tools are still under development and only have access to limited data, but they are a promising example of what may come in the very near future.

All sorts of new applications use the context of the information as well as its content to make determinations about the relationships between bits of data. SemaPlorer (http://btc.isweb.uni-koblenz.de/) and Xobni (http://www.xobni.com/), for example, organize information on travel plans and places or on the basis of e-mail contacts, and display them in convenient formats based on semantic connections. Semantic search is applied to scientific research, allowing researchers to find relevant information without having to analyze results that appear similar but are in fact irrelevant. This generally saves time and resources and increases efficiency.

Relevance for teaching, learning or creative inquiry

The semantic web has huge potential in teaching and learning. This is especially relevant in Iberoamerica, for two main reasons: it could act as a catalyst for the creation and collation of scattered or hidden

knowledge, and it ties in with other technologies that are penetrating this world region with force.

As we saw above and will see later in the examples and resources, the basic aim of the semantic web is to bring to light tacit knowledge or that which is implicit in the semantic relationships between scattered information. In a region where a great deal of knowledge is created but where, for geographical, economic and sociocultural reasons, it is still difficult to use, the semantic web could constitute a revolution in its reuse, with a special emphasis on the active role that students could have in this. At the very extreme, even the creation of new content could be assisted by semantic web tools.

Issues related to the quality of information, the localization and the contextualization of content or the legitimacy, reputation and authority of the authors – particularly when there are several, as is often the case with open content – may benefit from semantic tools.

When these authors are scattered across a large geographical area – as is the case of Ibero-America – but connected by networks and the Internet, the use of personal learning environments supported by the concurrence of ontologies, metadata, contextual semantic search engines, etc. they can really come to constitute one giant disperse campus. Thus, the management of personal learning networks could become a key tool if it is possible to extract the knowledge generated in them.

These personal learning environments can also feed from customized content, from syllabuses tailored to individual students based on what they already know, on what they have already explored, on who they know and with whom they work. At their destination, personal learning environments and tailored syllabuses are complemented by electronic portfolios, which, when correctly processed by semantics, could close the virtuous cycle of semantic web components, which could include virtual and decentralized libraries with the typical behaviours of emerging systems.

The semantic web, while remote from our everyday reality in many respects, can only be built with small steps. And these small steps are already being made in schools and universities across Ibero-America.

A sampling of semantic web projects in different disciplines includes the following:

- **Law and dispute resolution.** Researchers at the Universitat Autònoma de Barcelona (Spain) are working with semantic tools to assist experts in online dispute resolution (ODR). Thus, using legal ontologies and artificial intelligence, it could be much easier to reach settlements, given the greater concurrence of data, explanation of patterns and preferences (http://idt.uab.es).
- **Design.** The European TRENDS project uses semantic technology to retrieve images from the web, categorize them according to user definitions and study the image to locate trends and patterns that could be configuring them, with a view to using the latter as a guide in the production of industrial designs (http://www.trendsproject.org).
- **Mathematics.** The Wolfram|Alpha browser, based on semantic technology, allows searches of terms and mathematical formulas that the engine interprets as a task to be computed. This allows students, teachers and researchers to convert the search engine into a powerful calculation tool and to present the results of these calculations (http://www.wolframalpha.com/ http://www.ted.com/talks/lang/eng/stephen_wolfram_computing_a_theory_of_everything.html).
- **Cultural heritage.** The Fundación Marcelino Botín of Santander and the Universidad de Cantabria plan to publish the Cultural Heritage Site of Cantabria (Spain) in 2011. The website is being developed using a new ontology (http://www.fundacionmbotin.org/biblioteca/ontologia-del-patrimonio-de-cantabria.html) based on standards used in learning materials such as SCORM. As a result, its contents can be reused in the classroom.

Semantic web in practice

The following links provide examples of the semantic web.

Calais

http://www.opencalais.com

Calais is a web service that helps users to add sets of semantic metadata to the data supplied by the user in order to enrich it and make it easier to export, re-use, add to other data or simply find using semantic search engines.

DBpedia

http://dbpedia.org

Project aimed at restructuring the information contained in Wikipedia so that its information can be searched semantically. It will then be possible to make complex queries to Wikipedia, while also using alternative methods of browsing the results.

GeoNames
http://www.geonames.org/

Database with more than 8 million records of geographical names. The most interesting feature of this database – besides its size – is that all of the names include metadata allowing them to be semantically integrated into other web pages, applications, etc., by adding a layer of geographical information to any document.

Linked Data
http:///linkeddata.org

Initiative to link existing databases and documents on the web in order to create meaningful relationships between them.

SIMILE
http://simile.mit.edu/

SIMILE (Semantic Interoperability of Metadata and Information in unLike Environments) is a series of projects developed by the Massachusetts Institute of Technology. Their aim is to allow information to be presented in different ways – especially visually – and to feed this information with metadata so that it can be shared, syndicated or embedded in other content, which can easily be reused.

For further reading

The following articles and resources are recommended for those who wish to learn more about the semantic web.

The Fate of the Semantic Web
http://www.pewinternet.org/~/media//Files/Reports/2010/PIP-Future-of-the-Internet-Semantic-web.pdf

Report by the Pew Internet Project on the future of the Internet, which includes a section on the semantic web and general web developments. Besides presenting some basic concepts, the report contains the views of dozens of experts from around the world on the issue, covering all types of opinion, from the most pessimistic or contrary to the future of the semantic web to the most optimistic and favourable.

Semantic Web
http://www.w3.org/standards/semanticweb/

Official page of the World Wide Web Consortium on the semantic web. It contains a broad spectrum of information, ranging from definitions of the main contexts to the development of standards, programming languages, applications, etc.

A story about the Semantic Web
http://vimeo.com/11529540

Video interview by author Kate Ray in which she talks to leading thinkers and experts in the Internet and digital communication on the Web to come. The full video transcription is available at http://kateray.net/2010/05/17/transcript/.

Tim Berners-Lee on the Next Web
http://www.ted.com/talks/tim_berners_lee_on_the_next_web.html

Talk by Sir Tim Berners-Lee on TED Talks (February 2009), in which the creator of the Internet talks about its future and particularly on where it can go from here, explaining how a semantic web can actually be achieved, what the requirements for this would be and, most importantly, what its main applications would be.

¿Web 2.0, web 3.0 o web semántica?: El impacto en los sistemas de información de la web (Web 2.0, web 3.0 or semantic web?: the impact of information systems of the web)
http://www.lluiscodina.com/Web20_WebSemantica2009_Nov2009.pdf

(Lluís Codina, 2009). Paper presented at the I Congreso Internacional de Ciberperiodismo y Web 2.0 (First International Conference on Online Journalism and Web 2.0) in Bilbao (Spain), in which the author itemizes the main features of the semantic web and compares it to its "predecessors" Web 2.0 and Web 3.0.

Web semântica no ensino a distância (Semantic web in distance education)
http://www.periodicos.ufsc.br/index.php/eb/article/viewFile/7197/6643

(Andrenizia Aquino Eluan *et al.,* 2008). Introduction to the application of the semantic web in online education. Gives a basic overview and definition of the semantic web before moving quickly on to a presentation of practical experiences and possible applications in day-to-day *eLearning.*

Delicious: Semantic Web
http://delicious.com/tag/hz10ib+semanticweb

Follow this link to find tagged resources for this area and this edition of the *Horizon Report.* To add to this list, simply tag resources with “hz10ib” and “semanticweb” when you save them to Delicious.

METHODOLOGY

The process adopted to conduct the research and draft the *Horizon Report: Iberoamerican Edition* is based on the method used in the Horizon Project. All editions of the *Horizon Report* follow a carefully constructed process in both their primary and secondary research. Numerous technologies, meaningful trends and major challenges are examined for possible inclusion in the report each year and for every edition. All of the reports are based on the experience of an internationally renowned advisory board, which initially analyzes a wide range of technologies, challenges and emerging trends before examining each topic in greater detail, reducing this set until the final listing of the technologies, trends and challenges is selected.

Much of this process takes place online and is documented in the Horizon Project wiki, where all work related to the project is archived. The Horizon Project wiki is intended to be a completely transparent window to all the work connected with the project and it contains a complete record of all research undertaken in the various editions.

The section of the wiki corresponding to the iberoamerican edition can be found at http://ibero.wiki.nmc.org.

The process of selection of the topics covered in the report includes a modified Delphi process that has been refined over the various editions of the Horizon Reports. It begins with the convening of the Advisory Board. The aim is for the Board as a whole to represent a wide range of professional backgrounds, nationalities and interests, in which each member can contribute his or her particular experience. To date, hundreds of internationally recognized professionals and experts have participated on Horizon Project advisory boards: each year, one third of the members are renewed to ensure a constant flow of new perspectives.

Once the Advisory Board has been constituted for a given edition, its work begins with a systematic review of the literature – selected articles, reports, essays and other materials – on emerging technology. At the start of the project, the members of the Advisory Board are provided with a comprehensive set of introductory material. They are subsequently invited to comment to these, identifying the ones that seem particularly worthwhile and adding others to the list. The group analyzes the emerging technology applications that exist at the time and contributes ideas to incorporate new topics. An essential criterion for the inclusion of a topic is its potential relevance to teaching, learning, research or creative expression. A carefully selected set of RSS feeds, taken from relevant publications, ensures that the importance of preliminary resources does not wane as the project progresses, and they are used to keep participants informed throughout the process.

After reviewing the literature, the Advisory Board sets in motion the main part of the study – the research issues that form the core of the Horizon Project. These questions were designed in order to elicit from the Advisory Board a comprehensive listing of interesting technologies, challenges and trends:

1. *Which of the key technologies included in the Project Horizon list will be most important for teaching, learning or creative inquiry in the next five years?*
2. *What key technologies are not included in the list? Consider the following questions:*
   a. *What would you list among the established technologies that learning-focused institutions should all be using broadly today to support or enhance learning, or creative inquiry?*
   b. *What technologies that have a solid user base in consumer, entertainment, or other industries should learning-focused institutions be actively looking for ways to apply?*
   c. *What are the key emerging technologies you see developing to the point that learning-focused institutions should begin to take notice during the next four or five years?*
3. *What do you see as the key challenges related to teaching, learning or creative inquiry that higher education institutions will face during the next five years?*
4. *What trends do you expect to have a significant impact on the ways in which higher education institutions approach their core missions of teaching, research and service?*

One of the most important tasks of the Advisory Board is to answer these questions as systematically and broadly as possible in order to ensure that it includes the full range of relevant topics. Once it has completed this task, an activity on which it spends just a few days, the Advisory Board follows a process

to reach a single consensus using an iterative methodology based on Delphi.

In the first step of this process, each member of the Advisory Board systematically ranks the answers to the research questions and places them into adoption horizons in a multi-vote system that allows participants to weight their choices. Each member is also asked to identify the time frame in which it considers that use of the technology will become generalized, which, for the purposes of this project, is defined as its adoption by 20% of institutions in the period under review (this figure is based on research by Geoffrey A. Moore and refers to the critical mass of adoption necessary for a technology to have the possibility of becoming generalized). These rankings are compiled as a collective set of responses and, obviously, it is easy to spot those over which there is a greater consensus.

Of the exhaustive list of technologies that are analyzed at the start for any report, the twelve (four per adoption horizon) best placed in the initial ranking process are studied and explored in greater depth. After identifying this "short list", the group and the staff of the NMC and industry professionals begin to explore how these twelve key technologies could be applied to teaching, learning, research and/or creative expression. A significant amount of time is spent researching the current and potential applications for each of the areas of possible interest to professionals.

For each edition, once the work is completed, the twelve items on the "short list" are written up in the format of the *Horizon Report.* With the benefit of seeing how a given topic will look in the report as a whole, the "short list" is ranked again, this time with a reverse ranking approach. The resulting six technologies and applications are those described in the *Horizon Report.*

For more details on the methodology of the project or to view the instruments, ranking or intermediate products on which the report is based, please visit http://ibero.wiki.nmc.org.

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