

The emergence of the exciting new Web 3.0 and the future of Open Educational Resources.

Jose Bidarra (bidarra@univ-ab.pt)

Vitor Cardoso (vcardoso@univ-av.pt)

Universidade Aberta, Lisbon

Abstract

There is a general idea that video games can teach skills that are important in today's society, namely: analytical thinking, construction of hypotheses, development of strategies, creativity, team building, multitasking, decision making and problem solving. This idea frequently extends to situations that involve some kind of stress and require fast decisions. On the other hand, there is a perception that e-learning can benefit from video games, specially because they can make complex subjects more interesting and are able to cope with up-and-coming learning profiles. Avatar-based worlds, such as *Second Life*, possibly will provide for a richer, more effective and more enjoyable experience for students. The materialization of the so-called Web 3.0 (*Second Life*, *Divvio*, *Joost* and *VRML/X3D* worlds) following the mainstream collaborative and social Web 2.0 (*MySpace*, *Pandora*, *YouTube*), seems to be marked by this mix of humanlike avatars, intelligent agents and rich multimedia features that live happily within interactive 3D environments. No matter how interesting this may be for education, more research and practical experience are needed to make clear which features of games and 3D worlds are more important for nowadays learning and in what ways we can test students on the skills they actually learn. This paper investigates emergent experiences involving multimedia, video games and 3D environments freely available on the Web, and explores new ways to make e-learning more effective in the future realm of Open Educational Resources.

Keywords: Web 2.0, Web 3.0, 3D learning environments, Open Educational Resources

1. Introduction: the web has version numbers

With the massification of internet access worldwide the *digital world* has been a reality for several years now, with a determinant impact on day to day life. The *digital world* is bubbling with new players coming in, new ideas, new opportunities and a never ending digital industry growth and, because virtual reality has no boundaries or growth limit, it looks like a never ending story for many years to come!

Although some have doubted/objected of the interest of a Web designation with version numbers (including the founder of the Web: Tim Berners-Lee), the concept is out there and, at least, helps us understand some aspects of how the Web is evolving. To understand what is ahead, the false alarms and the best strategies to adopt, we must reflect on the Web versions and the reasons for the incredible success of this medium.

In this context, multimedia content represents a growing stake for companies and is oriented to a new consumer that makes use of collaborative sites such as *MySpace*, *Pandora*, *YouTube*, *Flickr* or *Wikipedia*. While the creation of blogs, wikis, podcasts and videoclips supports the so-called Web 2.0, the materialization of the new Web 3.0 is apparent in *Second Life*, *Divvio*, *Joost* and *VRML/X3D* worlds and seems to be marked by this mix of humanlike avatars, intelligent agents and rich multimedia features that live happily within interactive 3D environments. But is this trend really relevant? Does it affect education? Do we need new educational resources?

There is a general idea that video games can teach skills that are important in today's society, namely: analytical thinking, construction of hypotheses, development of strategies, creativity, team building, multitasking, decision making and problem solving. This idea frequently extends to situations that involve some kind of stress and require fast decisions. On the other hand, there is a perception that e-learning can benefit from video games, specially because they can make complex subjects more interesting and are able to cope with emerging learning profiles. Avatar-based worlds and communities, possibly will provide for a richer, more effective and more enjoyable experience for students. But no matter how interesting this may be for education, more research and practical experience are needed to make clear which features of games and 3D worlds are more important in nowadays learning and in what ways we can test students on the skills they actually learn.

2. Web 1.0 and 2.0: from multimedia information to collaboration

In the 90's many interesting, creative and diverse experiences were made with this new technology and a simplified classification is dangerous, but at first glance most of us then were producing or looking for information and multimedia on Web pages. It's important to note the multimedia nature of information on the Web. The Web significantly simplified the distribution and dissemination of digital content, more specifically multimedia content, an important asset of this new medium which attracted users (consumers and producers) and the communications and content industries.

The first web (Web 1.0) was an instant success also because it was so easy to browse and relatively easy to produce and distribute interesting content. Of course, there was, there is and there will be a difference in content produced by professionals and non professionals, but at each level it was relatively easy to use the new medium. In the "old days" low bandwidth was clearly the only regrettable problem.

A decade of vertiginous growth filled the World Wide Web servers with content. Much more than expected and surely more than a single user can handle even with the help of the fabulous search engines available. It was more and more perceived that human guidance and collaboration was needed to benefit in a better way from the huge amount of information potentially available. In the first years of the new millennium the old “newsgroup”, now called “forum” (many adapted or ported from Usenet and benefiting from its long experience), where easily accessed through WWW pages by everyone. Soon after appeared similar interfaces designated “blogs” and “wikis”. Eventually the Web 2.0 came to describe almost any site, service or technology that promoted sharing and collaboration. That includes blogs and wikis, tags and RSS feeds, del.icio.us and Flickr, MySpace and YouTube, indeed, because the Web 2.0 concept involves so many disparate ideas, some have questioned how meaningful and how useful it really is. However, multimedia content on the Web, which exploded in recent years, represents a growing stake for companies and is oriented to a new consumer that makes use of collaborative sites now benefiting of better streaming technologies and the dissemination of large bandwidth.

The easy success of collaboration in this time of the Web 2.0 is also due to the user friendliness of the collaboration tools (blogs, wikis and forums). It is really easy, rewarding and motivating, for the standard user, to participate regularly in Web communities, to blog and share content. It's important to follow-up and focus on (some of) the reasons for the rapid success of the Web, whatever the version number we are considering (figure 1).

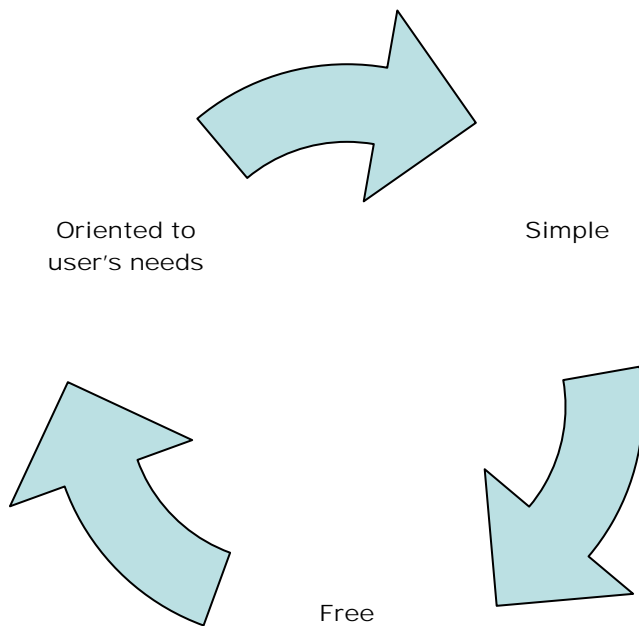


Figure 1: Web 1.0 and 2.0, elements for a strategy of success

It's reasonably clear that Web's 1.0 and 2.0 where user oriented: most available tools and systems to create, share, communicate and collaborate (like forums, blogs, share video, etc.) are, in many cases, *simple* and *free*. On top of that, they where oriented to the *user's needs* for content creation, communication and collaboration.

The presence of these three elements explain fairly well a strategy for success. This also applies to the *educational area* since most educators are frequent users of the Web. While many other technologies, for instance the stand alone computers of the eighties, have failed its extensive adoption by education practitioners, the Internet has been one of the most successful since the introduction of chalkboard or printed material and, undoubtedly, the most rapidly adopted. The Web repositories of Open Educational Resources (OER), now growing in size and scope, are typical of this recent trend in technology supported education.

3. The new frontier: two scenarios

Now we hear about a fore coming Web 3.0. For some time has been said that evolution would be towards a more structured and intelligent Web: the *semantic Web*, where information is not only stored with syntactical rules intended for human understanding but with semantic rules in a format that can be read and used by software agents, thus permitting them to find, share and integrate information more easily.

More recently, the explosion and popularity of 3D games and of 3D multi-user games and immersive “worlds” (e. g. *Second Life*) seems to point in another direction: a *3D multi-user Web*. Although they are both welcome and necessary steps in the evolution of the Web, as their proponents have demonstrated, neither of this two scenarios has the same simplicity we discussed about previous Web versions. They are technically more demanding in content creation and, in the particular case of the 3D Web, the user must also learn new ways to navigate and has to train new interaction skills.

This partially explains why semantic technologies, proposed since 2001 (Berners-Lee, 2001), have not taken off as much as was hoped (Copeland, 2007). The same could be said until recently (before the *Second Life* phenomenon) about the Web 3D, for which a concept has been proposed at the First World Wide Web Conference in 1994, where Mark Pesce e Tony Parisi presented the VRML (Pesce, 2004). Today, VRML and it's new successor X3D are free and open Web standards with a sustained evolution over the years.

4. The semantic Web

The emergence of the Web 3.0 implies an evolution towards structured data records that can be published on the Web in queryable formats, such as XML and RDF. It also means that we do not need to "go somewhere" to find information. It comes to us in packets or units, in essence, web pages are reduced to merely indexes accessible via a request. Essentially we are experiencing a more intelligent Web... the *Semantic Web*.

The *Semantic Web* is a set of technologies which are designed to enable a particular vision for the future of the Web in which all knowledge exists in a format that software applications can understand and reason about. By making knowledge more accessible to software, our digital tools will essentially become able to “understand” knowledge, “think” about knowledge, and “create” new knowledge. In other words, software will be able to be more intelligent — not as intelligent as humans perhaps, but more intelligent than say, your word processor is today (Nova Spivack, 2007).

Tim Berners-Lee idea that we are moving towards the *Semantic Web*, published in *Scientific American* in 2001, is today supported by a natural evolution of our experience and companies like *Google* are starting to develop technologies that shift in that direction. According to him (Berners-Lee, 2001): “The Semantic Web will bring structure to the meaningful content of Web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users”. For example, some of the intelligent systems now evolving, such as *del.icio.us* and *Digg*, are indeed representative of the *Semantic Web*. This is where *Second Life* comes in, as this move probably involves transforming the intelligent Web into a network of 3D environments to foster more natural means of reaching and collaborating with others.

5. Web 3.0: the Web 3D?

As said before, most technologies for a 3D Web have been developed and are in use for more than a decade - 3D objects on Web pages, 3D online games and applications, virtual world communities (like *Active Worlds*, *The Sims Online*, *Cybertown*, etc.), but their expression was, until recently, relatively small.

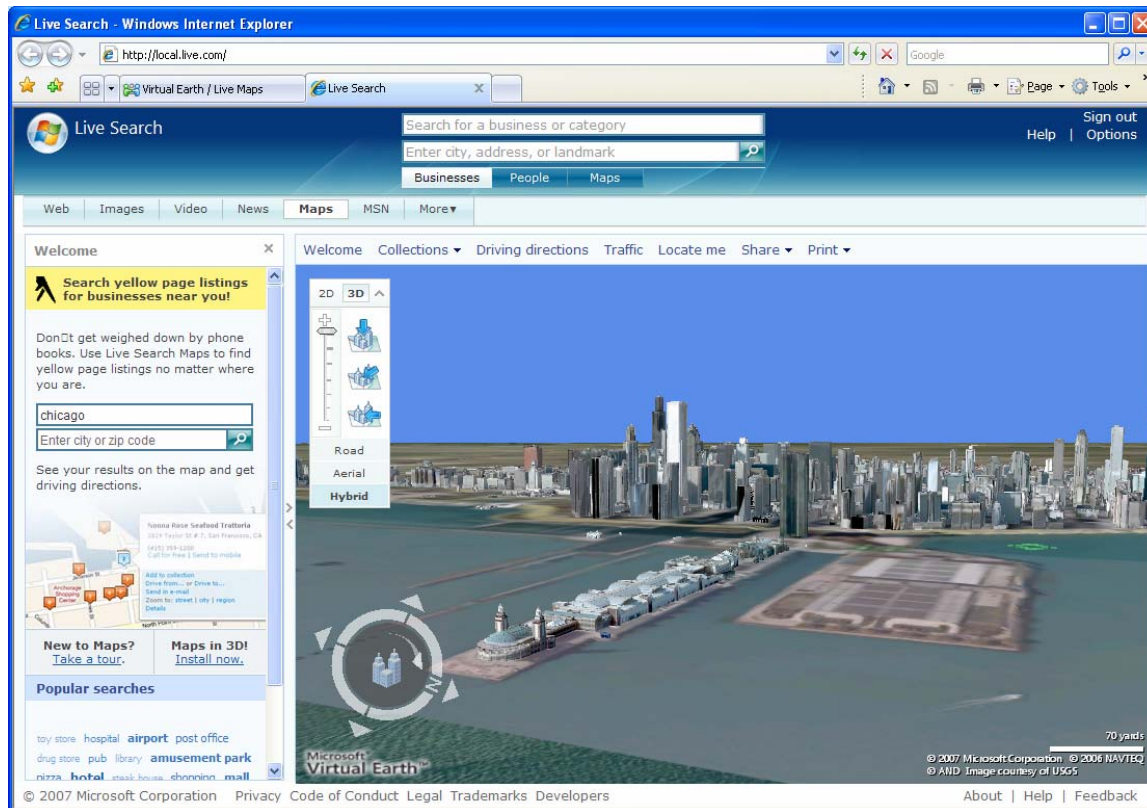


Figure 2: Virtual Earth from Microsoft

In the last 2-3 years the panorama has changed, the pace has increased and a global 3D movement on the Web is now clear:

- *3D global applications*: In recent years 3D applications like *Google Earth* (2004, which is more of an Internet application than a Web application since has its own browser

application), *Virtual Earth* (2004, a full Web application that runs inside the browser as seen in figure 2) and others have attained the public attention.

- *3D online Games*: major popular *3D games* have evolved from standalone to online environments that can congregate thousands or more gamers, to *Massive Multi-player Online Role Playing Games (MMORPG)* like *World of Warcraft* with more than 8 million online gamers.
- The *Second Life* community phenomenon (where the beautiful environments are mostly created by professionals and corporations that want to sell real and virtual products and promote brands) with millions of users and a success based on an intelligent marketing campaign. In technical terms we have to point out the bad physics of the SL engine, but nevertheless, this is the first collaborative virtual community to attain such a global expression.

Backtracking to the previous Web versions, while Web 1.0 made information easy to access and diffuse the Web 2.0 made collaboration possible and easy. In either case users frequently feel isolated and relatively distant: emails and messages in forums are not immediately answered and some messages are forgotten and/or never answered. Frequently asynchronous interaction is not enough and there is a strong need to interact synchronously. Users also need a closer and more emotional approach to engage in “live” interaction. That’s why chats and messengers became so popular among Web users. It has been already proposed (Cardoso, 2005) that educational and social Web sites in general (of any Web version, 1.0, 2.0 or 3.0) should provide this degree of informal “live” interaction. That has now become unquestionable in online games and virtual communities.

6. Innovating educational resources: what to do and how

We believe that the network distributed model of educational content will win out in the end, no matter we are considering the Web 2.0 or Web 3.0 (whatever its final form). However, open source code for 3D spaces/worlds similar to *Second Life* is already in the hands of many creative minds connected to the Web, so we should expect a shift towards user created 3D content, perhaps on a scale we haven’t seen before in visually immersive environments.

The current development of 3D originated in the last two decades with an impressive list of 3D systems, programs and engines (graphics, physics, etc.).

- *3D software and 3D engine libraries*: general purpose professional tools that can produce 3D scenes for almost any platform, online or stand alone. CAD and 3D design software like *3D Studio Max* (commercial) or *Blender* (free), used in conjunction with specialized software libraries (graphics, physics, sound, etc.)
- *Game modding*: the popularity of video game playing has increased and educators have sought video games as an instructional tool (serious games). Yet, creating videogames from ground up, using 3D general purpose software, to compete in quality with commercial games is not an easy task.



Figure 3: *Game Modding*, Sid Meier's Civilization IV game editor

Trough popular video games communities some educators have seen that the modification (or modding) of games using in-game editors (which are provided to permit the creation of new levels of the game by its users) is a good option. Editors can be quite simple/intuitive (as the one represented in figure 3) and may be used by instructors to introduce educational content into professionally designed video games, maintaining the same high graphic and game-play characteristics of their commercial peers (figure 6). The game modes can work online and/or offline according to game specifications.

- *Virtual communities* like *Second Life*, *Active Worlds*, *Cybertown*, etc. with their organized interface and user oriented set of tools are very attractive for educators. On the other hand, most of them have fees and are oriented to the professional user.
- *VRML/X3D*, is the “official” technology for the Web 3D (www.web3d.org) endorsed by the W3C consortium. It's free and open, proven and a very well known technology. A lot of good and free plugins (*Blaxxun*, *Cortona*, *Media Machines*, etc.) developed over the years are available and good servers too (some of them freely accessible to build and test online applications and communities). Several 3D multi-user communities (*Cybertown*) have been built around this technology over the years and this is undoubtedly one of the best options for 3D applications and communities over the Web.

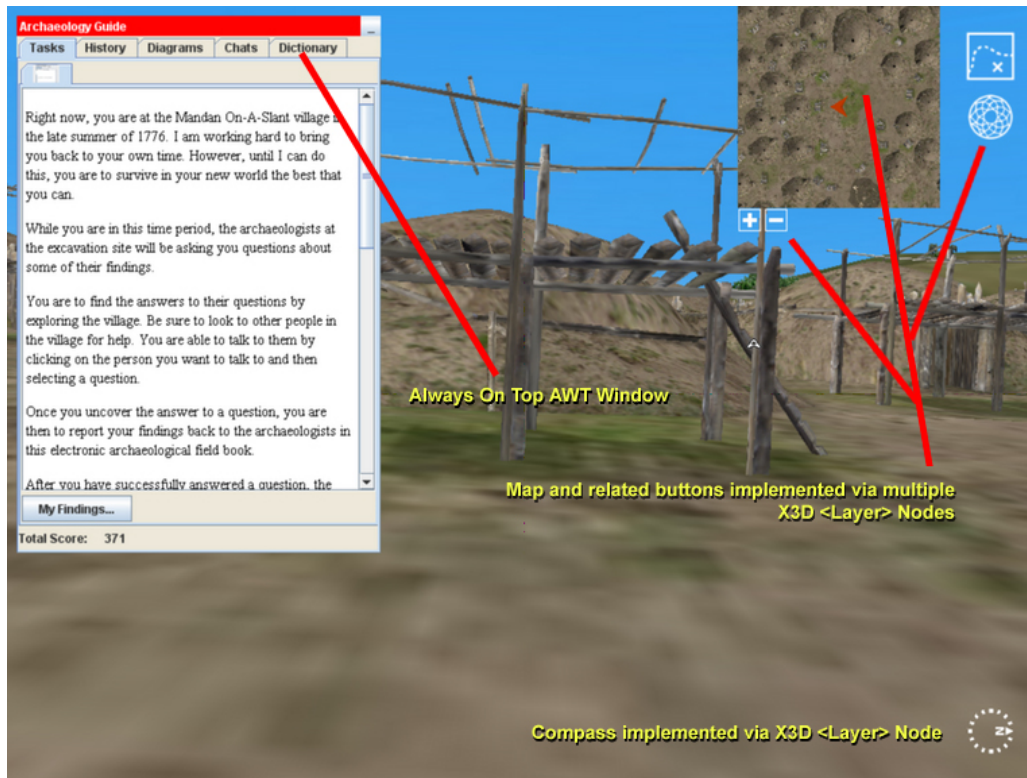


Figure 4: Archaeological site *On-A-Slant Virtual Village*, produced with X3D technology at Archaeology Technologies Laboratory, North Dakota State University

So how can the *Semantic Web* and the *3D Web* benefit education? Some examples, compiled from a survey of recent online experiences, show the possibility:

- *To visit places that are not accessible.* For instance, to take a look at ancient places of historical value, such as Athens, Troy or Rome. Advantages of 3D worlds: students can interact with the environment, other students and have their teacher as guide (figure 5). They can see how the pyramids could have been built or visit an Egyptian village. There is so much we can teach the students... and give them a safe way to experience such things.

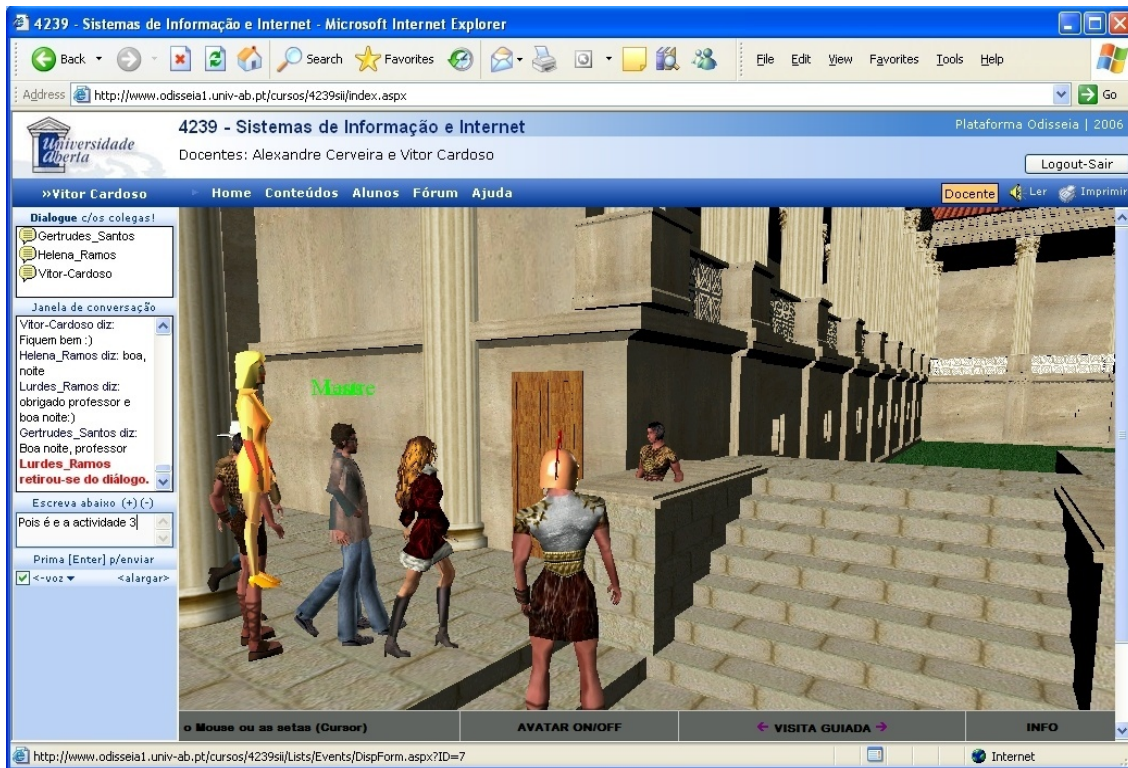


Figure 5: Multi-user study visit to a reconstitution of a Roman Forum (VRML/X3D) using the *Odisseia eLearning* platform (Cardoso, 2005)

- *To overcome stereotypes.* The creation of an avatar allows students to escape the stereotypes of their daily lives. We can ask them to be certain things to experience how it feels. We can take role play to a much higher level than ever before but we can also help students who are struggling to break out of what others "think" they should be.
- *To promote student collaboration.* Students can come together in distinctive and interesting ways. They can look at familiar websites, work on common projects, discuss, talk, connect, and chat. But further more now, they can fly over and move things around in a 3D world. They can even move about multiple 3D worlds instantaneously.
- *To foster assessment through Project Based Learning.* For instance, students can research and create a (virtual) village in the Roman Empire. Additionally, a whole group of students around the world could create this while attending a distance learning course.
- *To encourage role playing.* Students can role play and become the profile we want to teach. Court cases, psychological profiling, decision making, character development, theatrical plot, metaphors, and so on, can be taught in such an environment.
- *To create potential for group work.* We as educators spend so much time creating multimedia... in a perfect world we could share these resources and build on the work of one another. With the new generation 3D tools we can very easily create objects, with the accepted standards built in, to help the task of the instructional designer.

- *To develop scenarios and simulations.* The so-called *dry labs* are now tested online experiments, but what if online learners could go to an immersive virtual science lab to do experiments. After the simulation students could go offline into a real science lab to perform the correct experiment and see how it works. High level scientific experiments could be conducted, and expert technical training could be obtained, in ways that a university or school could not afford (imagine splitting atoms, conducting surgery (figure 6), flying a plane or exploring inhospitable environments).



Figure 6: *Pulse* – a medical simulation model for *Half Life 2* (CMP Media, 2005)

Today we know more and more about learning - and also about virtual environments - to make good instructional design choices. Perhaps we should not have to make risky experiments with our students each time a new technology emerges, but surely we should use technology as a tool for collaboration, creativity and constructivist learning. In this context, the prospects for using new Web 2.0 and Web 3.0 technology within the realm of *Open Educational Resources* (OER) seem to be interesting and desirable.

7. Strategic decisions for OER

The term *Open Educational Resources* (OER) was adopted at a UNESCO meeting in 2002 to refer to the open distribution of educational resources, enabled by Information and Communication Technologies, for consultation, use and adaptation by a community of users, however limited to non-commercial purposes. The participants then expressed “their wish to develop together a universal educational resource available for the whole of humanity... they hope that this open resource for the future mobilizes the whole of the world wide community of educators” (UNESCO, 2002).

From the previous discussion it is now clear that Information and Communication Technology (ICT) has already had a vast impact in many sectors of modern society, including education. However, while various new technologies have shown promise for education in the past, few have delivered on that promise, and many make the digital divide wider, not narrower. One of the reasons for this may have been a lack of available and appropriate content for the (new) technology in question. No doubt, the best tool is still the well-trained and experienced teacher. Yet, there's a strong push towards the educational use of games and virtual environments, such as *Second Life* and other Web 3.0 offsprings, following the emergence of a generation of digital natives in more developed countries.

Simultaneously with the emergence of the Web 3.0, recent developments in Europe show a consistent tendency towards the growth of OER, according to The William and Flora Hewlett Foundation (2007). Many organizations are building repositories for making a selection of learning materials available openly on the internet to learners and educators around the world. One of the latest, *OpenLearn -The Open University's* open content website, was formally launched in London last year.

In the *LearningSpace* part of the repository a user can sample OU-UK materials. The materials are designed to be studied flexibly, away from any formal teaching environment, by people who have many demands on their time, and who have a range of needs and experience.

The *LabSpace* section of *OpenLearn* is a community-led environment that provides users with the opportunity to take OU-UK materials and modify them for their use. *LabSpace* users can then share their modifications with others. This is an important and powerful example of the concept of sharing and reusing educational resources. It is intended for educational and other professional practitioners and more adventurous learners.

But sharing and reusing is not enough. A recent study by the International Institute for Educational Planning (UNESCO, 2007) indicates that Individuals and institutions interested in creating or adapting and reusing OER need support to help them develop their own capacity to do so. A solution to this problem is to promote the design of a *Do-It-Yourself* or *Do-It-Together* resource that would serve this function. This resource was seen as particularly important to support those in developing countries who want to create their own OER. From our point of view, the inclusion of Web 3.0 courseware and the potential of immersive environments as e-learning tools should also be considered in the current context.

8. Conclusions

The Metaweb graph (figure 7) by Nova Spivack (2004), building on the *Semantic Web* notion, is one interesting perspective on the future of the web. There is no doubt that the dominant environment for OER is via worldwide connected devices. The figure created in 2004 highlights the importance of technology connectivity linked to social connectivity. Perhaps we should now upgrade the graph to include 3D worlds and multimedia interactivity as part of current (immersive) environments build on a new kind of information and knowledge.

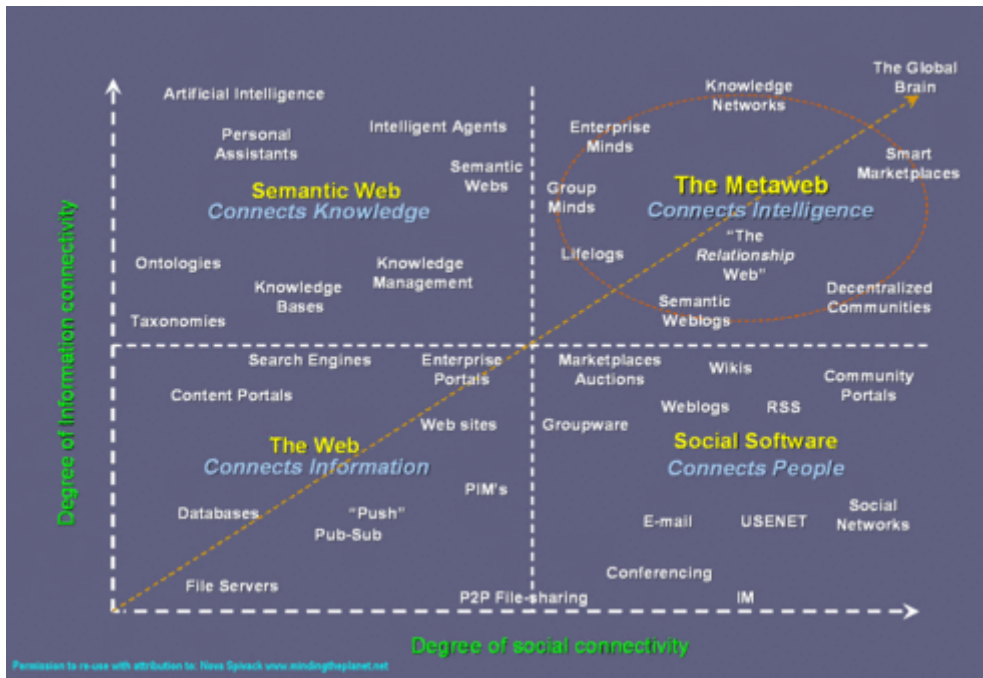


Figure 7: Metaweb graph (Spivack, 2004)

Predicting the future is not an easy task and has risks of its own, however, we feel there is a need for a more rational approach to understand new Web technologies and deal with the fundamental assumptions that may influence current decision making. The challenge we proposed here is to think about a sensible agenda for OER that is capable of keeping pace with social and technological change in this day and age.

9. References

- Berners-Lee, Tim (2001). *The Semantic Web*. Scientific American, May 17, 2001.
- Cardoso, Vitor (2005). *New Roles for Synchronous Communication in On-line Education: the Odisseia model for site structure integration*. First International Conference of Innovative Views of .NET Technologies, 121-132. ISEP & Microsoft, Porto, June 2005. http://w2ks.dei.isep.ipp.pt/labdotnet/files/IVNET/Odisseia_p.pdf
- CMP Media LLC (2005). Healthcare and Forestry – Half-Life 2: Meet Serious Games Modding. http://www.gamasutra.com/features/20051103/demaria_01.shtml
- Copeland, Michael V. (2007). What's next for the Internet, Business 2.0 Magazine, July 3, 2007
- Pesce, Mark (2004). VRML: The First Ten Years, 3d-test, May 25, 2004. http://www.3d-test.com/interviews/mediamachines_2.htm
- Spivack, Nova (2007). *Minding The Planet: The Meaning and Future of The Semantic Web*. <http://lifeboat.com/ex/minding.the.planet>

Spivack, Nova (2004). *New Version of My "Metaweb" Graph -- The Future of the Net*. Blog:
http://novaspivack.typepad.com/nova_spivacks_weblog/2004/04/new_version_of_.html

The William and Flora Hewlett Foundation (2007). *'06 Annual Report*.
<http://annualreport.hewlett.org/>

UNESCO, 2002. *Forum on the impact of Open Courseware for higher education in developing countries. Final report*. Paris: UNESCO.

UNESCO, 2007. *Open Educational Resources – The Way Forward*. Paris: UNESCO.