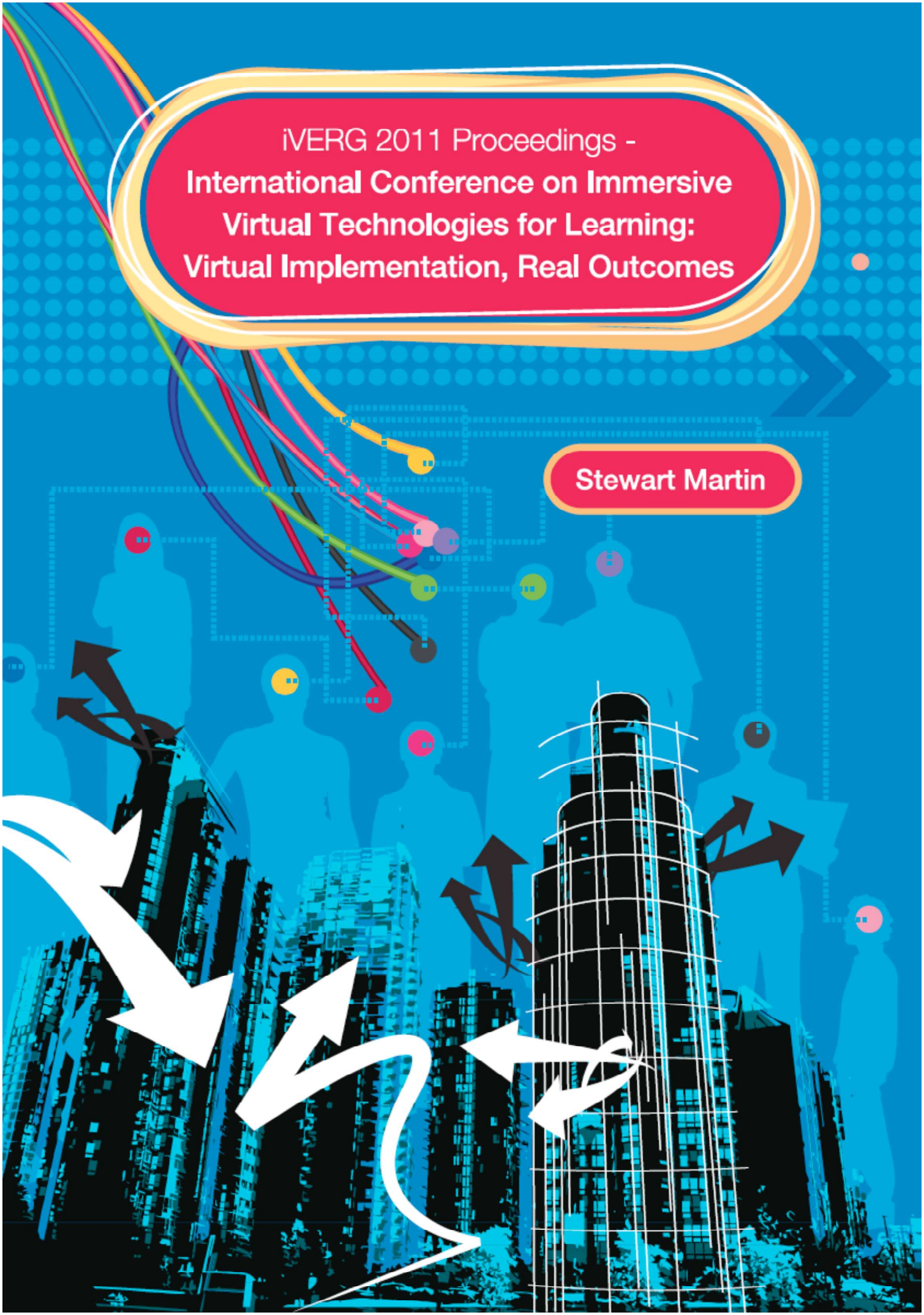
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Extending collaborative learning beyond the boundaries of the physical classroom through virtual environments

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Abstract. In this paper we outline some of the potentialities and barriers of 3-D immersive virtual worlds when used in a learning context combined with other online tools. Classrooms can be extended from physical to virtual space in order to fulfill students' needs and to facilitate a more collaborative learning style. Immersive learning allows us to learn in 1st person, allows us to have control over what we want to learn, how and when. The use of immersive 3-D virtual worlds allows students to participate in richer interactions at times that are more convenient to their work / study patterns, with no physical restrictions. Online web 2.0 tools, by being available at anytime and anywhere and user friendly, can enhance students' collaboration and sharing, promote students' socialization and improve classroom cohesion.

Keywords: Virtual Worlds, Second Life, Immersive and Social Learning, Tutoring, Higher Education

Introduction

There is a growing trend in education and training towards the use of online and distance learning courses. This delivery format provides flexibility and accessibility; it is also viewed as a way to provide education in a more effective way to a broader community. Online courses are comfortable, they are built under the missive of 'anyone, anywhere, anytime'. Everyone can participate from home or workplace.

Online courses can be developed in a variety of ways, for example, using a LMS (Learning Management System), a LCM (Learning Content System), or a Web 2.0 tool (or some mixture). These options, however, show limitations in terms of communication and interaction levels that can be achieved between students and between students and teachers. Most learning systems are asynchronous and do not allow an effective real-time interaction, collaboration and cooperation. Whilst they typically have synchronous chats and whiteboards, these capabilities are often sterile and do not stimulate the appropriate interactions that enhance learning. A rich interaction does not necessarily involve just verbal exchange since there is huge learning value to be gained from interacting with the learning

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content in a more visual and practical way. For instance, imagine the learning benefits from collaborating on a 3-D construction jointly and in real-time. Imagine watching the impact of soil erosion, or building and walking inside an heart model or a car engine. All this is possible in a 3-D immersive virtual world. Students can engage at a distance building content in real-time, collaboratively and interactively. On the net there can be found an array of virtual worlds, however we have chosen Second Life to show how teaching and learning can be enhanced through the use of this methodology. Second Life is immersive, enabling users to interact, communicate and collaborate as if in the real world. Second Life is a model of the real world, it shows an accurate physics simulation and it includes a meteorological and gravitational system; as such, anything can be modelled and simulated. Each user in the environment is represented by an avatar with all the features of a human being and avatars can manipulate the environment. Scientific experiments can be held in a very safe and controlled environment, and can be directly conducted by the scientist, teacher or tutor in charge. Scientific fields such as architecture, history, medicine, biology, sociology, programming, languages learning among many others can all be tested and researched through this virtual world. In next section we will outline some examples of the above mentioned features and potentialities.

Virtual Worlds - immersive experiences

In a virtual world such as Second Life people can have immersive experiences. It is a multi-user, collaborative or shared virtual environment. These environments or systems allow users to experience other participants as being present in the same space, they can interact with each other; this creates the feeling of being there together (Schroeder, 2008). This definition is focused on sensory experience. In a virtual world "Interaction with the world takes place in real time. When you do something in the world, you can expect feedback almost immediately. The world is shared. The world is (at least some degree) persistent" (Bartle, 2004), so there is an interaction between users despite not being physically in the same space (Wankel & Kingsley, 2008), stimulating immersive learning. A virtual world is also called as metaverse. The term metaverse was coined in Neal Stephenson's 1992 novel *Snow Crash*. Many of the virtual worlds we know today are based on Stephenson's metaverse concept, where "humans, as avatars, interact with each other and software agents, in a three-dimensional space that uses the metaphor of the real world" (Wikipedia, 2008). American National Standards (2007) defines a virtual world as a simulated environment that appears to have the characteristics of some other environment, and in which participants perceive themselves as interactive parts. For Bell (2008), a virtual world is a synchronous, persistent network of people, represented by avatars and facilitated by computers. PCMagazine's encyclopedia defines a virtual world as a "3-D computer environment in which users are represented on screen as themselves or as made-up characters and interact in real time with other users. Massively multiuser online games (MMOGs) and worlds such as Second Life are examples" (PCMagazine, 2011).

Virtual worlds already have an impact in real world society, particularly at business, art and education levels. For instance, as PCMagazine notes, "there are countless Second Life cultures and subcultures organized around arts, sports, games and other areas. Groups can be formed that simulate mini-companies and mini-communities. Even real companies, such

as Coca-Cola and Adidas participate in Second Life as a marketing venue. Numerous universities, including Harvard, Princeton and Vassar, offer online classes. Religious organizations hold meetings and starting with the Maldives and Sweden, countries have created virtual embassies. People find partners, have virtual sex and even get married in Second Life. In other words, Second Life is the virtual real world" (PCMagazine, 2011). Taking in account our experience, literature review and the research that is being developed, the virtual world we believe offers better features and more potentialities for educational use is Second Life.

Connecting learners through Virtual Worlds

Social technologies, like virtual worlds and web 2.0 tools, can bring an amount of benefits for learners (Kreijns, Kirschner & Jochems, 2003; McLoughlin & Lee, 2007) that can be summarized in five clusters:

- Participatory learning - foster participation in creation/editing of content;
- Collaborative learning – collaborative knowledge construction (information shared by individuals can be recombined to create new forms, concepts, ideas, mash-ups and services);
- Autonomous learning - share, communicate, and discover information in communities;
- Communication and interaction capabilities - richer opportunities for networking
- Lifelong learning (join the wisdom of the crowds) - develop digital competences and support lifelong development.

Despite the benefits, some challenges should also be considered. For learners to connect and take benefits they need to be motivated to interact. Social interaction will not automatically occur just because technology allows it. Therefore it shouldn't be taken for granted learners' capabilities and motivation to interact. The borders of the learning environment become diffused, therefore a careful planning and management is mandatory. Virtual worlds and Web 2.0 tools have their own dynamics and are transient environments - moderation becomes a requirement. Students are free to learn according with their own patterns, however a teacher or tutor should be a constant presence to guide and moderate.

Another aspect to consider is the difficulties in designing the new models of teaching and learning (Instructional Design). On the other hand higher level of anxiety are often associated with computer-mediated communication which may limit the degree of social interaction. In order to build group relationships and dynamics, students need to trust each other, feel a sense of belonging; and feel close to each other before they engage in collaboration and sharing - sense of community belonging.

Second Life as learning environment

Second Life is a free to use 3-D multi-user virtual world, immersive, imagined, designed, built and created by its users (residents or avatars). It is considered a playground for our imagination, a limitless platform – design, build, code, perform and collaborate, expanding the boundaries of creativity. It is a real life simulator (Loureiro & Bettencourt, 2010).

The immersive nature of SL allows walk through contents and information - students can learn by living or experiencing. With a 3-D representation of 'self' – the avatar - learning can be done in the 1st person. Features like communication, cooperation, collaboration, interaction and information sharing are in real time. Students can learn by doing and they can more easily engage with content (Loureiro, Wood & Bettencourt, 2010). SL is also a major social network and a wide community of practice (Wenger, 1998). SL is not a game but it offers the attractiveness of 3-D gaming and therefore the sensation of learning by playing (Loureiro, Wood & Bettencourt, 2010). As Lim (2009) suggested there are six learning styles that can be applied within SL:

- Learning by exploring - students can learn by visiting and explore buildings, landscapes, communities that are simulated and modelled;
- Learning by collaborating - students can work in teams, collaboratively and in real-time on common projects or on problem-solving tasks, discussions can also be made in group and collaboratively;
- Learning by being - students can immerse in role-playing and performance activities, they can also explore the self and experiment different identities through avatar customization and by creating different characters;
- Learning by building - students can with no restrictions build any kind of objects or environments and experiencing in real-time the results;
- Learning by championing - students can get involved into activities and causes related and with an impact in real-life (such as cancer campaign, earthquake victims support);
- Learning by expressing - students can show and present their in-world activities to out-side world audience, by authoring blogs, machinimas, papers, posters or by participating in conferences and meetings.
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By exploring those potentialities, virtual classrooms can emerge and learning can be enhanced.

One particularly interesting feature of version 2.0 of SL viewer is the possibility of adding shared media to an object. This means anyone can add web-based media content to the surface of any object and place it in-world or attach it to an avatar. For instance, it is possible to be inside SL, running, adding and modifying contents in an external web site and the audience in-world can watch it in real-time. These tasks can be made collaboratively.

Another interesting feature, especially for those who use Moodle as a LMS is the possibility of connecting and integrating it into SL - through Sloodle (Simulation Linked Object Oriented Dynamic Learning Environment). The use of LMS in e-learning has limitations as the students only have to deal with specific activities (Yasar & Adiguzel, 2010) but Sloodle provides a variety of tools for supporting learning contexts in immersive virtual environments, providing experiences and opportunities for students to collaborate, cooperate and interact with the objects. By connecting Moodle and SL it is possible, for instance, to have the same chat session running in real-time on both platforms – students can chose in which one to be, or connect at both. Chat logs are also saved in the Moodle database. A tool, called Web-intercom, can be used "to enhance the communication between learners who are involved in the activities within both SL and Moodle" (Yasar & Adiguzel,

2010) and is important to students as "an aide-memoir and to help them reflect later on their experiences in the virtual world" (Livingstone, Kemp & Edgar, 2008). Another feature of Sloodle is that SL and Moodle accounts can be linked. This feature provides a better management of students' progress, allowing teacher to track students by their avatar names (Yasar & Adiguzel, 2010). It is also possible to set quizzes - QuizChair - where students "attempt a standard Moodle multiple-choice quiz inside SL, with the answers being stored on Moodle" (Kem, Livingstone & Bloomfield, 2009) (in Yasar & Adiguzel, 2010). Students can create 3-D objects and deliver their assignment using the drop-box tool and teachers can review their work and provide feedback in Moodle (Livingstone, Kemp & Edgar, 2008). It also has the Presenter tool with the possibility of showing slides and/or webpages, for students and teacher share their work. For those who like to have a more close control over participants it is also possible to set (via a Sloodle toolbar) a function to collect a list of avatars or Moodle users connected at a certain time/date.

In next section we will describe a study that is being carried out and how learning was orchestrated in an extended classroom.

Second Life & Web 2.0 tools as an extended classroom - the case study

The main research motivation came up from a problem detected in classes. There were students with different levels of confidence; full-time (day class) and part-time students (night class); only meet each class once a week. Teacher wanted students to work in groups and to actively participate and collaborate in class activities. The dilemma came up when teacher started to wonder how to engage all students and how to support all students. Create an extended classroom by using virtual worlds and web 2.0 seemed to be a way. A case study was outlined and set to gain experience of the use of virtual worlds (Second Life) and social web tools (namely Facebook and Diigo) in learning contexts and therefore to encourage collaboration, sharing and class cohesion 'out of hours' by providing means for students and teacher to interact. With this experience teacher wanted to:

- cover some theoretical subjects as part of the course curriculum in a more creative way;
- help students to understand the importance of sharing and discussing information in an open manner;
- provide tutorial support to the part-time class through a virtual environment.

As a major goal teacher (which is also the researcher) wanted to evaluate the effectiveness of blended learning as a format to achieve the teaching goals.

The study research question was to understand if there are best practices orchestrating learning in virtual and immersive environments and if they will enhance blended learning through knowledge sharing. Study components are related with construction and knowledge sharing; interpersonal relationships/interactions; collaborative virtual environments (CVE). The premise is that socialization is a key factor for collaborative and social learning - and that means connecting, communicating, interacting and establishing relationships. Main background theories that underpins research are Connectivism

(Siemens, 2004; Downes, 2006) and Social Constructivism (Prawat & Floden, 1994; McMahon, 1997).

Methodology

This is a qualitative study, with an inductive and exploratory nature where the researcher is a participant observer. Participants are Portuguese higher education students from a faculty of education. Students belong to two different groups, undergraduate regular day classes and undergraduate mature night classes (ages > 23 years old). They follow exactly the same syllabus in an identical curriculum. This is a non probabilistic sample (by convenience).
Data has being collected through direct observation, questionnaire and electronic records (snapshots and log chats). Analysis is quantitative over qualitative data - content analysis.
The study goals are to:

- identify the variables that might influence knowledge sharing;
- contribute for richer learning contexts through the use of online tools (Diigo, Facebook) and virtual worlds (Second Life);
- provide tutorial support to night class through a virtual world;
- encourage collaboration 'out of hours' by providing means for students and teacher to interact;
- learn what advantages we can find in an online tutorial implemented using an immersive virtual world;
- understand how and which students engage with an immersive 3-D world and how effective it is as a proxy for face-to-face interaction;
- understand how well online tools and virtual worlds promote knowledge sharing and enhance socialization in order to contribute for classroom cohesion;
- provide some insights for better online teaching strategies.

The tools used in the now extended classroom are Moodle (official faculty LMS); Diigo (prescribed by teacher); Second Life ("selected" by students) and Facebook (on students request).

In Fig. 1 we present an image showing how learning was orchestrated in the extended classroom in order to enhance knowledge sharing and socialization among students.

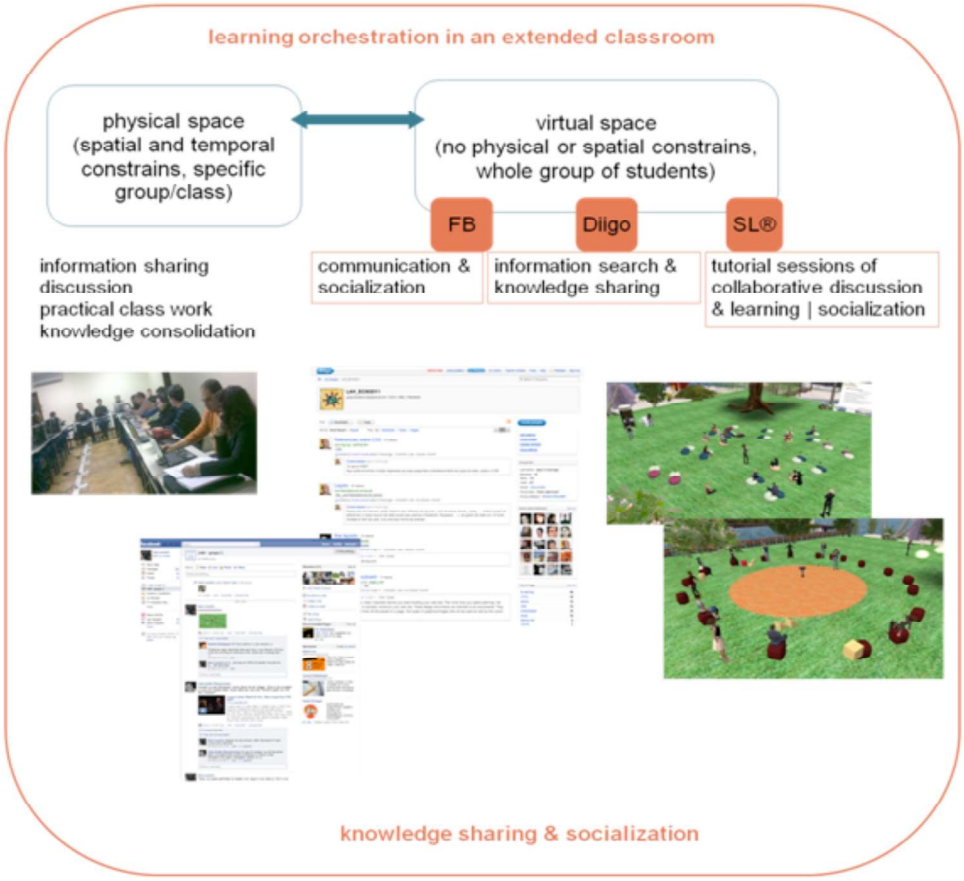

Fig. 1 - learning orchestration

Physical classroom was enhanced with a virtual classroom by adding extra spaces for students to share, interact, collaborate, socialize and communicate - extended classroom.

Findings

Although the study is ongoing some findings can be outlined:

- initial set up cost of starting SL is high (time);
- students engaged in-world beyond tutorial hours;
- tutorial sessions were considered as a success for the mature night class;
- students didn't use the support hours available at school (physical space);
- night students shared more information at Diigo ;
- day students created a Facebook page for a more direct communication;
- night students elected email as primary way for communication;
- students posted more information than teacher, with relevance for night students;
- the quality of shared information was high (relevant) – development of search competences;
- posts were moderated (by teacher and students) - development of critical analysis and reflection skills;
- students prefer in-world sessions out of official school islands – informal places not perceived as an extension to the 'bricks and mortar' university;
- night (mature) students are more independent as learners;
- night students have less time and more desire to learn in the most effective way;

- night students are more motivated since they have stronger reasons to study in their spare time;
- day students are taking full advantage of the social side of university;
- virtual spaces support the work patterns of mature students in particular.

We can summarize saying that the contrast of behavior between day and night students is a function of maturity; level of independence as learners and intrinsic motivation. The motivation aspect needs further and deeper evaluation - where free will is involved. In that way we may say that an online tutorial established in a virtual world might suit better the mature students and this might be a way to help them to keep in touch with the teacher and to maintain class cohesion.

Final reflection

Design and implement an extended classroom through the use of online tools and virtual worlds requires preparation, time and means. We cannot take participation in computer-supported collaborative learning (CSCL) environments for granted, there is the need to ignite and maintain it. Students have to be prompt and reminded about their roles, they should be able to embrace autonomy but teacher needs to provide the right incentives. Interactivity has to be improved (two way connection between distributed students) by organising social interaction, collaboration and shared activities - otherwise it is unlikely to occur or be meaningful. In an extended classroom, teacher also has to foster a sense of community and encourage development of a social presence.

Do not replicate traditional classrooms in online environments, it is pointless if what only changes is the place/space (I mean there is no point having students sit in rows listening to lecturers in a virtual environment for instance) - take advantage of the potentialities of the virtual space in use. Employ designs that focus on collaborative, networked communication and interaction which seems to be what students expect nowadays – without losing the informality. It is crucial to focus more on the actors and their needs rather than the technology (it's all about people after all).

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