

Universities in SL: Reflections and Guidelines to Implement the Education of Engineering in Virtual Realities

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Abstract:

The present paper points the challenges and perspectives of the project involving the use of the environment SL as complementary resource for the education of Engineering in Universities. The use of this 3D environment in an University scope demands a new philosophy from the professor. In this new context the students allow themselves to live deeply experimentation situations that would not be possible with the resources of traditional classroom. As well as the organization of a multidisciplinary team for modelling and supporting the activities carried through in the SL. This paper presents some reflections concerning the teach-learning process face to the new context related to the Internet and its resources, to open up a new way to teach students. The question related to the knowledge construction, identification of the necessary abilities of the professor, the activities, considering itself the SL as a possible platform to support Education activities by distance could be the first set of challenges. From this experience on using problem based learning it was found that students are not lazy: they aren't engaged. From this personal experience, it was clear that teachers got to learn how read and take in information faster as one has a house full of books screaming at to be read. One wants to could learn more by reading books and more books, but at the end can't even finish one. So it is clear by fact that the old methods doesn't work for all, if it works for any. How do teachers engage their students to actively learn is reflected in the present paper. A motivation for me to debate and spread my ideas in these areas is to want to move away from the slow and painful way of learning that was implementes had through a new, funnier and more natural way to learn.

Keywords:

Pedagogy, Experiential Learning, Practical Learning, Virtual Community, Second Life (SL), Distance Learning, Information and Communication Technologies (ICT), Learning Theory, Experiences, Motivation

1. Introduction

The contemporary society is marked by the change of the paradigm that the productive process is based on the domain and production of the knowledge, called «Society of Learning» [6]. It closely is influenced by the media and for Research and Development (R&D). This environment drives to the configuration and promotion of new interactive spaces, where the individual can learn and acquire new abilities. [7] suggests the possibility to divide the society in two distinct groups: the Digital Natives and Digital immigrants. The first group is represented by young people that already had been born in an interactive environment and are completely participants. These individuals already possess this form of language present in its social interactions, thereby they easily adapt and they incorporate the innumerable changes more easily that occur daily. For them, Orkut, MSN, YouTube, Flirck, LAN Houses, Blogs and Photo blogs are part of their daily activities. The digital immigrant group is the one that had not been born in this environment, but they had adapted to it as they had to migrate for these interactive environments by social or professional reasons. They are adapted but they still keep typical characteristics of one foreigner. These people, theoretically, would have more easiness of adapting, living deeply and to acquire knowledge in virtual activities than the people of the other group, the Digital Immigrants. A great number of students, all digital natives, virtually communicate with each other, studies together and amuse through available tools in cyberspace. That is, independent of the social and the economic status, the access to the Internet and the use of computers are growing and growing through time. Every year, the worldwide number of Internet users is growing. Actually more than 50% of the world population uses the Internet [8]. Due to this trend, for thousands of companies, the Internet has become the main sales channel. They offer services and products via web pages, and their revenues are influenced by user experience (UX) of the website. The same interest can be replicated to schools.

The protocol with Universities by software companies, such as Microsoft, to obtain free software to students and professors was another incentive for higher level of education. Another reality to consider is the LAN House (where people pay to use a computer with access to Internet, with the main end to play in net) where the geographically dispersed young players joint in a group to play together. Nowadays, the proposed project is easier and more suitable for all parts. According to the statistics, the median web page has a sum of transferred data of around 1500 KB [9].

The incentive to develop informatics-based higher education in Portugal was made by the Portuguese government in the last years with the support the acquisition of personal computers and access to home internet connection for all needed families and students (Program Magalhães), making possible an easier access to the ICT.

2. The SL Environment and the New Process of Learning

SL was first launched in June of 2003. It is the end product of approximately nine years in development by Linden Laboratories (SL Wiki, 2009). SL is a user generated virtual world. It looks and essentially reacts like a video game. The SL is a available online digital reality in 3D where one could be what he wants, can make what he desires, be able to never live deeply imagined experiences and can changed themselves into what always had dream, changing the form as we communicate and live. Also, in the SL it is possible to assimilate new paradigms and to share these new experiences with others avatars. It is in constant update and growth, due to hundreds of new residents that each day enters and creates their Avatars (a computer user's representation of himself/herself or alter ego. It is an “object” representing the

embodiment of the user) being able to explore the world and to know people. It is a world imagined, created and kept by its residents. The main goal of the environment is to stimulate each person to find a way to survive, learn and develop trades that will reflect in its purchasing power. The user will be able to create objects, to construct property, to develop accessories and others, through links to insert objects inside the SL, such as banners, building walls, figures, 3D objects, posters and so on. In the same way, it is possible to add a Slur (an Internet address that transports the avatar inside an indicated virtual place). This possibility to create links between the Internet and the game SL and these new tools of cooperation and coordination in real time, allows to a leverage of sensitivity, perception, thought, imagination, for instance. The interaction possibilities of this new modality of human activity and with this new technology are the engine for the university to explore not far beyond the game SL.

SL has a highly graphical nature, is open sourced and any user can create 3D objects.

It is impossible to deny that there is a shift in education to this new digital virtual world. Students today need to be immersed in what they are learning - not dealing only with static things like pictures and books. An immersive world allows the student to move, talk, build, and connect with the very information that they are learning - they can be surrounded by it and then they can contribute to it. [10] However, the pedagogical use of these resources in the different levels of education in schools is still very distant to be implemented. The main cause of this relies on the inadequate formation of the professor to adapt to new methodologies to work with ICT in the Education. The present times demands for multiple abilities to elaborate actual (or even sophisticated) pedagogical applications. The project must start to analyze the question of the construction of knowledge, specifically associate to the education of Engineering, through the environment SL (SL).

In this context of cyberspace (the virtual environment that makes it possible) and cyberculture (The culture in the contemporary form marked for the Digital Technologies and associate to the Internet), many questions emerge to be analyzed for the professors and researchers in Education. Making the construction of knowledge from the exchange of experiences inside of this digital space, where the students will be part of learning is disruptive. Amongst the different possibilities (use of Weblogs, video streaming, video demand, interactive digital TV and others), the professor will have to guide the study of its students, stimulating the research and exchange knowledge in this virtual world.

The environment of the SL allows the development of simulations that would be impossible in the real life. In SL, one can fly inside of a hurricane, which is wonderful for understanding aerodynamics. In SL, one can have Newton talking to students, walk us around to all the different habitats, homes, and areas that they inhabit or did at one time. Touring the inside of a nuclear reactor is not possible for security and safety reasons. However, SL opens the doors and allows it, enhancing direct conversations on topics like nuclear fission.

The environment of the SL allows participating in bigger and more complex projects. The use of visualization to teach complex and often abstract concepts is a good application for this new learning.

The environment of the SL allows adding interactivity knowledge. It is possible to use this concept in a class by building learning objects based on your subject topics. If

one is unsure what or how to do that, then make their creation a class project picking only one or two specific concepts. From term to term one can have the next year's students elaborate on previous objects.

The environment of the SL even allows gaining social behavior confidence. SL's reason for existence is to interact with others. In the virtual environment students could also practice their foreign language skills by communicating with one another.

Abilities can perfectly be applied in virtual world with the situations of the real life. The SL is linked to the reality: the difference between the Real Life and the Virtual Life will be the amount of control that we will have on our existence. At least, it is an environment that can open new ways to explore the construction /reconstruction of knowledge. The challenge is to understand and to identify the best form to use it.

Decades of research shows that soft skills, or social skills, are best developed through interactive practice [11]. In the virtual world these skills can be practiced in a variety of ways: the assigned virtual task is not the learning objective instead it is a method for practicing a skill. For a professor, the task begins by identifying the soft skills that your students need to practice. This may include less tangible skills such as critical thinking, problem solving, team building, and collaboration. The professor can be part of the activity or simply assign it as an exercise.

Students often seem unwilling to put in the required effort needed to succeed. The professor has to be curious about student's methods to learn and interact. New techniques and philosophies are constantly being developed and tried in the classroom. Some techniques take in information faster and learn how to retain it. However, it's important to recognize the distinction between information intake and appreciation of learning.

Anonymity can be a potent tool for helping people feel empowered to take risks because of the lack of consequences associated with actions taken in a virtual world. Have you ever wondered what your students would say about your class if they could hide behind an avatar? SL can be used as a place where students can express themselves more honestly, talk about touchy or confidential matters, take social risks, and overcome fears. Nearly any situation, where anonymity enhances the quality of the communication, virtual worlds can be valuable. On the other side, anonymity can be dangerous because no one can be blamed for a penalty if one doesn't know who committed it.

3. Implementation

For a few time this idea sounds great and professors dedicate a lot of hard work and extra time (which they really don't have except sacrificing their spare time), hoping to accelerate learning and increase knowledge in students. Vividly curious times and with great anticipation expect of new experiences: exploring the use of virtual worlds as an educational tool in several disciplines were considered an emerging tendency. However, there were some drawbacks that discourage the continuity of the tendency. Schools found that leveraging a SL presence wasn't easy no matter how much a virtual classroom looked like a real one. Problems surfaced almost immediately. Technical glitches and a rather cumbersome user interface took some of the shine off of this brave new (virtual) world. Combine these issues with students who are perceived to be lazy, disengaged and unprepared for college, [12] let alone life, and you have a recipe for disaster.

Running a class that uses SL as a playground takes a lot of work and preparation. Developing a simulation involves a great deal of planning. First of all, the “What Do Students Learn?” should be shifted to “how do students learn?”. For the first approach it is crucial to focus on main ideas analyzing them to get a great comprehension.

The next pictures show the different possible environments to be used in the education of engineering in SL [17].

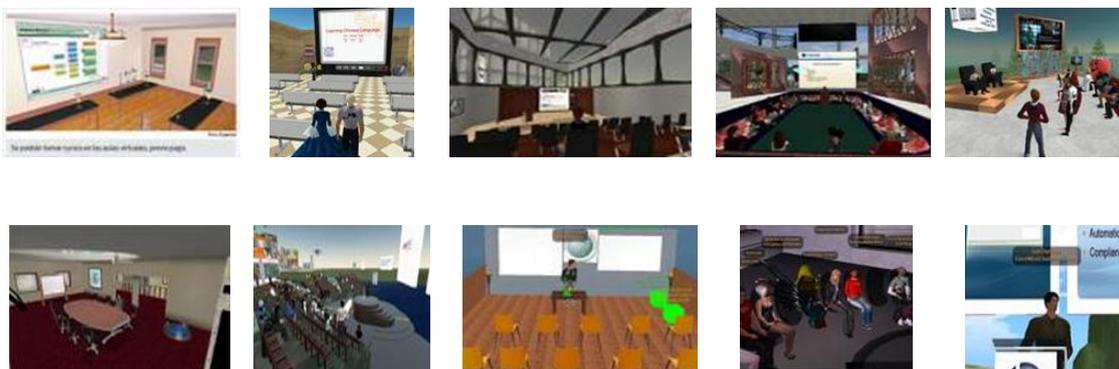


Figure 1. Possible environments for teaching and learning.

Many aspects related to the use of environment SL as additional resource to the process of teach-learning of contents, specifically in those subjects of more traditional form of presentation can be incorporated. In this environment appears some perspectives and ideas that can assist in the construction of knowledge in the scope of the education of engineering. The organization of the activities, the process of formation of the professor for use of SL, the consolidation and integration of the team will consume most of the destined time to the project. In the implementation and exploitation, some experiments can be carried through to test questions related to the accessibility, usability, relevance of the activities proposals and adequacy of the work. The major improvement is the possibility to build activities to be constructed in the SL to allow the experimentation of situations that would not be possible in the classroom traditional, such as: machine overrunning, faults simulation and long term fatigue.

Simulations are often designed to allow the student to practice a process. Unlike role playing where the student is primarily practicing a skill; simulations allow the student to either concentrate on a process and/or their role in that process. In addition, simulations in virtual worlds can be seen as a combination of role play and data visualization. Simulations offer an excellent vehicle for teaching through trial and error.

Not only are virtual worlds operating in real time, but they also can host material that can be accessed at a later time. Your interactive library can involve a combination of different resources. From creatively displayed web links to instructional video clips, learning objects, text based documents, interactive spreadsheets, blogs, wikis and branching stories. Such libraries take time to build on your own. Consider establishing a team to develop it. Start by collecting what you already have in your school. Search data banks for subject specific learning aids. Search SL itself. Check with your national associations; The National Archives in Britain has free material, France, Germany, Holland and Sweden Governments all have free material (some of which are available in English), Films For Learning [24] has student created educational

videos and Learn Out Loud [25] has podcasts of many classical pieces of literature. Libraries from other institutions are also a great resource. Involve your students in the creation or expansion of their virtual world library. And don't forget to try and include your actual librarians. Events can be either streamed live or recorded for on-demand viewing. [19]

Invite guest speakers or make an alliance with a school that is teaching a similar course. Often school calendars and dramatically different time zones can cause scheduling conflicts.

Students can offer some fascinating ideas. Students can meet through rotating avatars to discuss their dissatisfaction with their program. The professor can be part of the activity or simply assign it as an exercise.

To avoid miss abuse, there should be a list of real data of the virtual user that can be used when a penalty from him occurs.

This is perhaps the most fun and often the scariest way to use SL. Scary in the sense that it is outside the comfort zone of many educators. It is based on the open learning concepts and theories of action learning [49]. Virtual Action Learning (VAL) draws from experiential learning [50], reflective problem solving [51], andragogy theory [52] and combines them with elearning pedagogies [7,53]. [54] define VAL as "...action learning which takes place in a virtual environment... via a range of enabling, interactive and collaborative technologies" [7]. In SL, VAL can be used as pedagogical strategy. In its simplest form it involves getting your students to participate in the decision making process regarding how to accomplish the learning objectives. This is done through cycles of learning sets that involve inquiries, action and reflection. The amount of real life places to visit in SL needs no explanation: Electricity museum,

Overcoming pedagogical challenges was of greater importance than overcoming technical barriers.

An experientially based class is basically an exercise in frustration, for both students and professor. For students the lack of structure of a class like this can be very frustrating. The students have had very little time in their lives to play and their wonder of exploration has never been instilled in them.

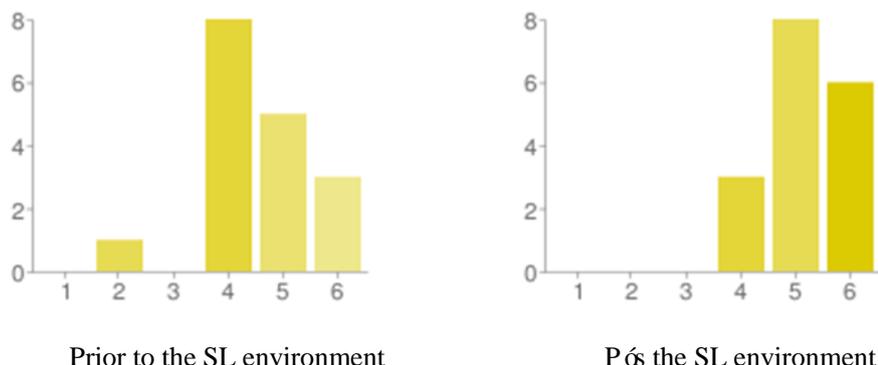
It is important to think on dual encoding, i.e., adding information to the existing information able to keep in mind and don't forget because the hippocampus of the brain recognizes it and stores for longer time.

4. Results

After each semester I performed a evaluation questionnaire for the students to understand the impact of the problem based learning. The following Figures shows the data for a 10 semester period. The values in Y-axis are in the unit 100 students. The questionnaire was anonymous, prior to the evaluation grades being published and after the evaluation exams were done.

It is not possible to publish in this paper the grades but it is notable the evolution on the grades by students, reaching an enhance of about 25% in the first semesters. Therefore, there was possible to get deep in issues and apply for the critical spirit of the students.

In the Figure 2, it is presented the answer on the question 1: “Do I find the learning process interesting?”. The aim of this question is to have a comparisons term on the existing method and the proposed new one.

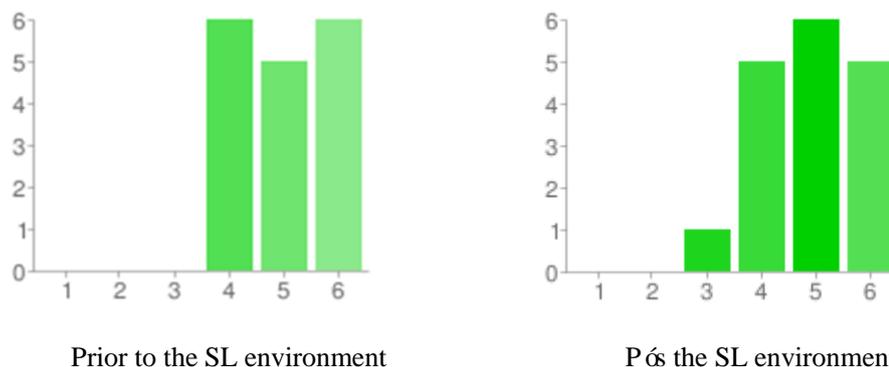


X-Axis scale: 1-not at all -0% 2-6% 3-0% 4-47% 5-29% 6 -very much -18%
Y-Axis units: Number of students (centesimal)

Figure 2. Answer to question 1: “Do I find the learning process interesting?”

It is possible to clear identify a great achievement: Students are (more) motivated.

In the Figure 3, it is presented the answer on the question 2: “Can I understand the lectures?”

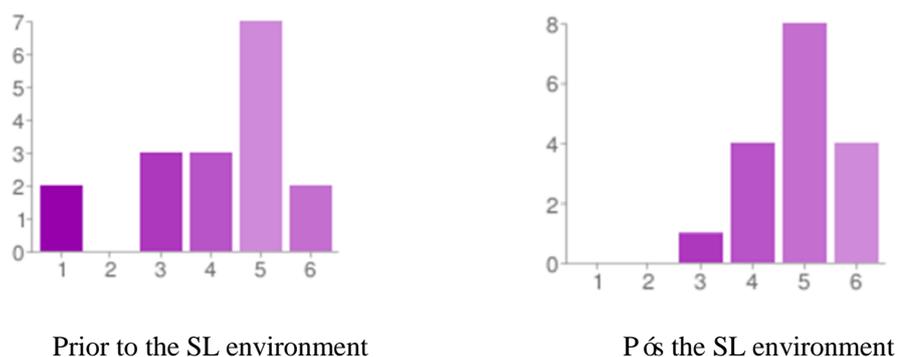


X-Axis scale: 1-hardly-0% 2-0% 3-0% 4-35% 5-29% 6-easily-35%
Y-Axis units: Number of students (centesimal)

Figure 3. Answer to question 2: “Can I understand the lectures?”

One can see that the answers are very similar. However, in the new method the complexity of the lectures increased a lot comparing to the previous lectures in the old method. Thereby, students were more challenged but didn't felt step aside on the increasing difficulty.

In the Figure 4, it is presented the answer on the question 3: “Am I interested in participate in the class?”



X-Axis scale: 1-not at all-12% 2-0% 3-18% 4-18% 5-41% 6 -very much-12%.

Y-Axis units: Number of students (centesimal)

Figure 4. Answer to question 3: “Am I interested in participate in the class?”

It is possible also to clear identify a great achievement: Students are (more) motivated.

It is not possible to publish in this paper the grades (due to data privacy from students and from school) but it is notable the evolution on the grades by students, reaching and enhance of about 25% in the first semesters.

The analysis of the answers and the students’ interest came as a motivation for the SL environment development.

5. Examples Around the World

Many schools invested In SL as a means of pedagogical delivery. It seemed logical that since SL could look like a classroom it should be able to be used as a classroom. While Linden Labs have improved the ability of SL to facilitate a lecture it still takes quite a bit of prep work to make it happen. The dominant means of communication in SL is simple text messaging. People type whatever they have to say. This is fine for a casual conversation or a transaction but it doesn’t work for an hour-long discussion. Linden Labs did add voice capabilities so that one could actually lecture but it has been buggy and one still has the feeling of talking into a black hole where no one is listening. Even if lecturing is usable presenting a slide show is not. Presenting a PowerPoint presentation requires that one make a separate JPEG image of each PPT slide and then load each individually into SL (at 10\$L each) and then place them into a program that can present them in world. This added complication, plus the slow rate for slide changes, reduces the efficacy of presenting a SL lesson. [18]

Several schools have started to build their own collection of learning objects and organize them in an interactive library accessible through their SL Island. Ohio University (USA) has learning kiosks where students watch short videos, take quizzes and play learning games. [20] Fontys Hogeschool-University of Applied Sciences (Netherlands) has similar learning stations where students can also contribute to a class blog, see examples of content discussed in their lectures and prepare for exams. [21] At Lancaster University (UK) educators are working to link freely available non-virtual world learning objects from sources such as JISC (UK), [22] The National Archives (British) [23] and other public domain libraries. Through links in SL, professors can encourage their students to access a plethora of learning objects, articles and multimedia educational projects.

The Open University (UK) recently concluded a series of pilot studies, conducted in Teen SL, referred to as Schome Park [26]. This project brought together students from the UK and USA to work together. In addition, the staff was made up of a variety of professors and researchers that were likely to have never collaborated without the virtual world. Throughout the Schome Park project on the teen grid, professors, researchers and students gathered together for various social occasions.

On Harvard's (USA) Berkman Island law students practice their litigation skills [27]. Educators in Singapore used space on the teen grid to conduct role playing lessons to practice negotiation skills [13].

Activities organized on Minerva Island, by Andrew Mac ás-D áz for the School of Management at the University of St Andrews (Scotland) uses SL to teach film students how to arrange and hook up production equipment. Students move objects and simulate the connection of particular pieces of video equipment. Failure to connect them in the proper sequence with the proper items results in them not working. Correct connections allow the students to see the final arrangement functioning properly. Fontys Hogeschool University of Applied Sciences (Netherlands) has a giant eyeball on their island. Enter the eye and you can experience what it is like to have severe vision problems or blindness. The virtual island of Ann Myers Medical Center (Canada) uses a combination of role play and simulations to train medical students [14]. SL simulations for medical purposes appear to be growing rapidly as evident by the recent surge of new medical education Sims affiliated with both North American and European institutions.

At Fontys Hogeschool-University of Applied Sciences (Netherlands) students can play a knowledge game. Similar to a question and answer game except that avatars must move to a different location before answering and before the time runs out. The scramble to move against a clock while trying to think of the correct response is both fun and challenging.

The University of Southern Queensland (Australia) reports using SL specifically for action learning sets. [15] The Open University's Schome Park project used a similar pedagogy. We suspect that there are many other schools using SL in this capacity. Currently, at Lancaster University (UK), we are preparing to perform a fully integrated a VAL pedagogy using SL as an educational tool.

Further examples of education and nonprofits in SL, the leader solution for virtual meetings, events, training and simulations can be explored. [16]

[17] shows you how to get started on SL, How to Create a Avatar, How to Use SL and how a virtual classroom would work with a traditional classroom. So if SL doesn't work as a classroom how can one successfully use it? The lesson to be learned is that SL is not a classroom that is insulated from distractions but a playground where students can learn by doing. [18]

It is a massive undertaking to develop and present a virtual world that is constantly changing. Glitches include not being able to log in, losing inventory, getting stuck in places and not being able to get out, etc.

SL uses what is known as a traditional WSAD interface, i.e., uses the computer keyboard to manipulate events in world. (One uses the W key to move forward, the S key to move backward and the A and D keys to move to the sides). This means that keystrokes must match gestures and motions. This approach while fairly easily

learned does not present much mimesis to the environment and often gets in the way [28].

Anything that a resident creates is owned by the resident and not Linden Labs. These built in intellectual property rights subscribe to the rules governing the Digital Millennium Copyright Act (Public Law, 1998: pg. 105–304). When a resident creates something they have the option of selling it (and setting their own price), giving it away, making copies or keeping it as an original piece.

6. Discussion

The SL is considered only as a play environment in 3D (three dimensions), as an explored potential vehicle of virtual human relations and for marketing proposes. However, the SL (SL) can be a possible platform to support activities of distance Education and learning, where the students will be able to live deeply the practical situations; thereby the virtual experience allows them to construct their knowledge. The main aspects to emphasize on analyze the project are the possibilities offered to the students to reconstruct their knowledge in a friendly and known environment, to link the geographically distant professor and students as partners in the education process, and finally, to identify available educational applications already in the SL. Then there is a need to identify how the students interact, the desired type of content and type of professor's participation.

To implement this project, it exists the necessity of establishing a team of interdisciplinary knowledge and competences. The necessity of investment in the hardware is low and investment in the software for construction is free. The prerequisite for use of this project proposal do not imply that professor must have knowledge of computer science to be the producer of activities in the SL but to be the pedagogical designer of the activity. The activities in the project potentialities offered in the SL bring the next challenge that is to give continuity in the use of the tool in an ampler and complete situation of classroom. There the students will be able to live deeply the practical situations, allowing an ampler analysis concerning possibilities of the environment. The biggest challenges to the organization that validate the proposal will be: the organization of the team, acquisition of knowledge on functioning of the SL and understand that type of activities to extend the work carried through in the actual classroom. The project requires an interdisciplinary team with professionals of the area of the Education, Pedagogy, specialist in SL, deriving programmers of the part of Systems of Information and professors of engineer. This complementary conjunction of abilities work will be decisive to reach the objective joins peers and engage students. Several profiles must be considered for elaboration of educational applications since the challenges are of technological and pedagogical order.

Developing a simulation involves a great deal of planning and is time consuming. Investigating ways to use SL for teaching has been an enlightening experience. This study will expand on these ideas and provide more empirical evidence, as long as there are enthusiastic educators that want to take their students in world.

For more than a decade, I'm focusing on Problem Based Learning with better cooperation by students. Other benefits include a distinct attitude change from the students, but it didn't happen during the course of the semesters I tried to implement it. However, I'm sure that I communicate more as an entrepreneurial as in a traditional class. Learning is a process that requires practice like all other activities. Learning how to teach better is no exception on time and energy dedication.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article

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