E-LEARNING DESIGN AND SECOND LIFE: A RESEARCH ON AFFORDANCES

LAURA FEDELI

University of Macerata, Faculty of Education Sciences, laura.fedeli@unimc.it

Abstract: *Second Life is a socially-driven multi-user virtual environment internationally recognized as a valuable e-learning "platform" to run both formal and informal educational activities. From the analysis of the main affordances of the virtual world the paper aims at highlighting the major instructional design issues raised by a qualitative research that involved three different groups of Italian teachers during a period of two years.*

Keywords: *E-Learning, Instructional Design, Virtual Worlds, Second Life*

1. INTRODUCTION

Opened to the public in 2003, "Second Life" is a multi-user virtual environment (MUVE) developed by Linden Lab, a San Francisco-based corporation.

In 2001 Philip Rosedale, the founder of the corporation, created "LindenWorld", a private virtual space designed to develop the research in the field of haptic technologies [1].

LindenWorld became, two years later, the well known and most popular MUVE renamed as "Second Life" (hereafter "SL").

The online 3D virtual world developed by Linden Lab is currently one of the largest social MUVEs: as of August 2011 the grid spans 2040.99 square kilometers [2] including both mainland and private regions owned by SL users and Linden Homes.

SL is, in fact, a second home to over 24 million registered avatars [3], who spent a total amount of 104 million hours logged into the world in the first quarter of 2011 [4].

SL is open on basic free registration (a paid premium account is also available) to people aged 16 and over; after registration the user can log in by downloading a client program, either the official SL viewer or one by a third-party developer who complies with the policy and the SL Terms of Service.

Allowing access to teens aged 16–17 years is a new policy communicated by Linden Lab in August 2010, and that choice led to the closure of the so-called "Teen Grid", a protected space that was accessible from 2006 till the end of 2010 by 13–17 year olds; younger teens (13–15) cannot currently have full access to the Main Grid but get only a restricted permission to access the estate of a sponsoring organization [5].

Registered users live *in-world*[1] as *residents* as customised avatars who can interact both synchronously (written/voice chat, private individual/group instant messaging) and asynchronously (e.g. sending an e-mail from in-world).

Communication and networking features let avatars meet, socialize, and engage in social, cultural, and entertainment activities.

Avatars can interact with objects as well, and primitive shapes called "prims" can be used to build more complex objects and become interactive if provided with a script ("LSL", the Linden Script Language).

The ability to create artefacts, modify the surrounding place, and have a virtual property affects the flexibility of the whole environment and the control any avatar can have of itself (movement, gesture and posing, communication) in a 3D space that can be experienced as physical.

2. BACKGROUND

In the long history of development of virtual worlds it was with the "Multi-User Dungeon" (MUD) [6] that researchers began seeing those environments as opportunities for "creation", "personalization", and "socialization".

From the end of the 1970s, in fact, when Trubshaw and Bartle programmed the first MUD in MACRO-10 at Essex University in the UK, the concept of the multi-user environment started spreading but we had to wait till 1995 for the first 3D virtual world, AlphaWorld.

Today SL, defined as a socially oriented MUVE, represents the enhancement of the above mentioned environments in terms of both technical aspects (e.g. graphics) and sociological ones.

The unique attributes of SL, which will be better described in the next paragraph, contribute to reinforcing a sense of presence that can affect users' motivation and their engagement in the world; these key factors have encouraged educational researchers to approach SL as an immersive online environment suitable for teaching and learning.

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[1] What happens within SL is referred to as *in-world* as opposed to life in the real world, which is referred to as *out-of-world*.

International initiatives in the field of education in terms of both courses run completely in SL (in both formal and informal settings) and educational/didactical implemented services (e.g. museums and libraries) are very relevant to fostering a deeper analysis of the "affordances" of the environment and developing research areas in the field of instructional design for e-learning using virtual worlds.

Currently the *Sim Tech Wiki* [7] lists a presence of over 260 international educational institutions including universities, colleges, schools, and other organizations which have a stable location in-world.

But the activism in this direction is mostly evident in the huge amount of research projects focused on didactics and aiming at raising awareness about a fruitful use of SL.

Among the largest international associations of educators we can mention SLED (SL Educators) [8], VWER (Virtual Worlds Education Roundtable) [9], and RezEd [10] .

3. THE SECOND LIFE AFFORDANCES

Like the SL resident quoted in Boellstorff [11] who confessed to having always been "fascinated by the idea of people creating the world around them", many researchers and educators are focusing on the same experiential aspect of the avatars' lives as an undeniable positive affordance allowed by SL.

The concept of affordance, a central theoretical construct of ecological psychology, was introduced by James J. Gibson in 1979 [12].

An affordance is a property of an object, animal, or environment that affords, or makes available, certain actions.

The affordances of the environment, Gibson suggested, are the "offerings" of the environment, roughly the sets of threats (negative affordances) and promises (positive affordances) that characterize items in the environment [12].

SL is an environment that can afford a variety of actions, for example an object that can be moved thanks to a "script" can be defined as "script-*able*" using the linguistic construct often used by Gibson, namely [verb phrase]-*able*.

SL also affords different mental states, which in turn affect how people act in these worlds and interact with one another, which then affect feelings of presence and flow [13].

MUVEs like SL have unique affordances that can provide opportunities for a richer embodied social presence, sensory immersive experiences, hands-on activities, and authentic contexts for experiential learning.

In the present Paragraph 3, main affordances will be identified and described for further discussion in order to highlight some key aspects to be addressed when designing an online course using SL:
- Avatars' identity and "embodiment";
- Communication and interaction;
- Artefacts' creation and data visualization.

The development of the concept behind the term "avatar" is complex: it evolved from an entity represented in the chatrooms by "a string of six letters" [14] to a highly personalized 3D body as in virtual worlds.

That process brought a subsequent change of perspective in the users' attitude to the extreme experience of an almost complete brand new "life" experiences through an embodied avatar.

Any user registering an account in SL, in fact, immediately gets a 3D graphic representation that is the most immediate connection to a body presence.

The concept of embodiment, literally the act of "embodying", underlines the role of the avatar-body in the process of the identity formation.

It does not matter whether or not the avatar has an anthropomorphic appearance, but the way he or she looks will affect the sense of both presence and social presence [15], [16].

The avatar's appearance (shape and skin, clothing and accessories) and public profile can help others infer information about his or her identity: age (*newbie*, *midbie*, *oldbie*[2]), background (race and/or community of belonging), and habits (favourite places, interests, etc.) and somehow affect the level and quality of interaction in the virtual world.

Every avatar in SL builds its own story and identity; he or she lives in a "metaphor-free" environment, a world "in progress, not a pseudoworld or fictional universe, a virtual reality and not a simulacrum of reality" [17].

In the construction of his or her personal story the avatar keeps and takes as a reference the memories of the environment in which he or she is immersed.

The faculty of having memories and feeling emotions and physical sensations [18] contributes to valuing the experience in SL: by stating in the first person: "I have built that object", "I have participated in that event", the avatar demonstrates that he or she has lived an embodied experience.

As Taylor [19] highlights, users, embodying themselves through their avatars, make their engagement real: "Avatars are particularly powerful artifacts to consider. They prove to be the material out of which relationships and interactions are embodied: much as in offline life with its corporeal bodies, digital bodies are used in a variety of ways – to greet, to play, to signal group affiliation, to convey opinions or feelings, and to create closeness. At a very basic level, bodies root us and make us present, to ourselves and to others. Avatars form one of the central points at which users intersect with a technological object and embody themselves, making the virtual environment and the variety of phenomenon it fosters real".

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[2] These terms refer to avatars who are new to a virtual world, have an average expertise, or are very experienced, respectively.

Because SL is a socially driven virtual world [20], tools and features available in the program interface allow an enhanced flow of communication dynamics.

Avatars can interact and move within the environment, being "present" on different levels: occupying a physical space and a definite position described by the coordinates in the world map and communicating using written or oral language through both synchronous and asynchronous tools but also expressing themselves through extra-linguistic codes (proxemics, kinesthetics).

Dawley [21] highlights the impact that those tools have in activating a social networking process. She expressely mentions "group notice", "group chat", "newsletters", "building", "group events", "IM/private chat", and "conferences" as powerful opportunities to create, maintain, and develop social relations within the world.

But social networking seems to afford new options in SL since it is possible not only to interact in-world but also to connect with people out-of-world through the brand new network tool based on the avatars' web profiles (http://my.secondlife.com/*accountname*).

With the newly released viewer (version 2.8.0) the network is integrated directly in the avatar profile and it is not necessary to use an external browser to access the network page: avatars can now chat both synchronously and asynchronously across two worlds, the real one and the virtual one, where the terms "real" and "virtual" definitely lose their oxymoronic value.

Having a web profile where the avatars'/users' interests are listed enhances the chances of meeting new residents through the service "recommendation" that highlights and select a list of avatars who share the same interests and that can be immediately added to the friendlist.

Moreover, it is possible to connect SL web profiles with other powerful social networks such as Facebook and Twitter, where the same users claim to have accounts with their SL name and last name.

More and more, SL identities are entering the real world, passing through that "porous membrane" addressed by Castronova [22] which separates the real world from the virtual one: "In the case of synthetic worlds, however, this membrane is actually quite porous. Indeed it cannot be sealed completely: people are crossing it all the time in both directions, carrying their behavioural assumptions and attitudes with them".

The last aspect which makes SL a unique online environment is the technical attributes like the 3D space and the related opportunities such as 3D data visualization.

Being able to create, modify, and arrange its own space, every avatar is given the chance to be an active resident.

Research about educational exploitation of this affordance is not only focused on the scientific area, where the 3D feature undoubtedly proves to enhance the productivity of the process of scientific visualisation [23].

In SL there exist several examples of educational uses of 3D visualization in the form of both data display and tools.

Many attempts have been made to develop data visualization tools and they have resulted in powerful projects such as the one in the "Sustainable Energy Science Lab - Etopia Island", where in-world anemometers and graphs, web-based wind roses and histograms and, finally, the exemplar case of "NOAA Real-Time U.S. Weather Sim", a powerful visualization of real-time data, can be found [24].

An example of an interactive data visualization tool is the periodic table of elements displayed and made available at "Drexel Island": this 3D model is based upon the 2D spiral periodic table presented in 1960 by Prof. Theodor Benfey. As explained by the creator of the in-world tool, "the table is interactive, that is, clicking on each element you get a brief description of its history and properties plus a link to more information; the elements sizes are based upon their theoretical atomic radii to give the viewer an idea of their relative sizes".

Thanks to 3D building opportunities avatars can express, in every field, their own creativity and experience collaboration and co-creation that could be not experienced elsewhere with the same efficacy.

3. THE RESEARCH FRAMEWORK

A qualitative research has been run by the author [15] [18] in two main steps: the analysis of two case-studies and a subsequent investigation which involved a sample of participants with predetermined requisites.

The case-studies were represented by the *post-lauream* teachers' training course "Teaching and Learning with MUVES" run by the University of Macerata (Italy) in the academic years 2008/09 and 2009/10.

About 30 teachers in total participated in the two courses and offered the opportunity to obtain a first collection of data: almost all participants had no previous didactical experience in the virtual world.

In this first step the data's sources were: students' narratives, notes from the researcher's observations of participants, and a web-based questionnaire submitted at the end of the course.

The use of a questionnaire and the analysis of the written reflections on the student's learning path in the training course contributed to making a more meaningful use of the notes from the observations used as "a method to develop a holistic understanding of the phenomena under study that is as objective and accurate as possible given the limitations of the method" [25].

Those data were compared with the ones gathered in the following phase of the research in which about 20 participants were selected among Italian teachers who had had a previous educational experience in SL as either students or teachers.

SL is, today, a concrete option in the design of distance education courses and the aim of the research was to satisfy the need to provide the e-learning designer, the

teacher, and the tutor with a theoretical-practical reference for a conscious and competent use of the affordances in the virtual world.

The affordances mentioned in the present contribution were the focus of the investigation that aimed at underlining their implications for didactics and instructional design.

The "philosophical worldview" [26] chosen as reference for the present research is a socio-constructivist perspective [27].

In such a perspective the research is mostly based on participants' viewpoints and perceptions and for those reasons it was necessary to use techniques of data gathering that offer open questions and opportunities for interaction among the participants in order to socially negotiate their subjective meanings [28].

Moreover, the choice of a phenomenological approach [26] within the general perspective of the research's framework was relevant to determining the participants' experiences of their lives in the virtual world in order to be able to elaborate models and relations connected to the aspects investigated: identity, interaction, and creation opportunities in SL.

Having a small group of participants with whom an extensive and deep contact has been planned is consistent with the procedural parameters of a phenomenological approach and with the objectives of the research.

The data were collected in three steps through different techniques: a web-based questionnaire, an interview held individually with each participant, and three focus groups where participants were divided into three mini-groups; both the interviews and the focus groups were run in-world.

The analysis of data took advantage of a coding process developed with the support of the NVIVO qualitative analysis software.

4. INPUTS ON INSTRUCTIONAL DESIGN

The research data provided several inputs that can serve as a useful background for the process of instructional design in SL.
The affordances previously highlighted will be discussed here in terms of optimization of the macro and micro design issues and organized into the following areas:
- learning model;
- didactical strategies;
- staff involved: profiles and skills.

The specificity of the creative and social environment along with its flexibility suggests that an SL course would be more properly designed according to a didactical path based on a learning-team-centred model [29].

The value attributed by the research data to the interactional aspect justifies the choice to foster the active participation of the learner in the group of peers.

The didactical strategies that were found to be more effective are the ones that rely on direct experimentation in explorative paths and on the manipulation of objects

and spaces in order to let learners visualize and "touch" abstract concepts.

A molecule developed through a scripted tool in SL is no longer a model to look at, an "epistemic thing" (as defined by Rheinberger, quoted in [30]) but an "embodied object", an object that rotates in the space and that students can create, modify, and also walk through.

Because SL is an experiential environment it will be adequate to organize a course around "performance objectives" [31], that is, objectives that can describe what the learner will actually be able to do after the instruction.

The use of didactical strategies such as "treasure hunts", "virtual quests", "roleplays", and "simulations" lets the learner live through an experience rather then just reading about or listening to it and is consistent with the achievement of the performance objectives.

Design in SL needs to satify a learning model based on a dialectics between "action/reflection" and "experience/abstraction", opening a new pedagogy that is able to "provide a body to the thoughts and provide thoughts to the body" [32].

The e-learning design process also implies the definition of the technical support provided to the learners: the availability of a team of professionals that can assist the teacher.

If normally a teacher shares the online environment with one or more class tutors (subject matter experts and/or relational tutors) to scaffold learning and solve any technical/practical problems that may occur online, in SL the teacher and the tutor profiles definitely require new skills [15].

Being a teacher in SL, independently from the discipline (humanistic or scientific), requires at least a basic knowledge of scripting and 3D building. A lack of skills in those aspects would make the use of SL as a learning environment inappropriate: all the affordances tied to objects' creation and management would be useless and the use of SL unwarranted.

What also emerged from the investigation is that the affordances related to the embodiment of the avatar and the many levels of enhanced communication in-world do change the dimension of the teacher professionalism.

The management of an online learning path implies the mastery of all those relational skills and competencies in order to facilitate the communication and collaboration among students in the virtual environment [29].

In SL the management of the group class relies on communication, aggregation, and collaboration tools which are definitely different from the common channels present in a learning management system or in real world social networking web 2.0 environments.

Communication and interaction happen through a body-avatar in all the nuances tied to the state of "having a body" or, better, "being a body". Those implications concern the avatar's appearance, gestures, and ways he or she moves in the surrounding space via animations to show his or her presence.

Data retrieved from the participants in the research highlighted that the value of the social interaction and reputation in SL emerges through the avatar's duties, habits, hobbies, and relationships. A personalized appearance makes the avatar a unique entity and a focus on these aspects is needed to help the teacher be a reliable presence in-world.

But what does it mean to be reliable in-world? Teachers are required to show their mastery not only of the discipline but also in the care they show for their avatars and a savvy use of all of SL's features.

Teachers need to share with their students a common "SL etiquette" to define time and modalities of contacts for course-related matters.

SL is not a learning management system; users do not log in just when they want to access course materials, fulfil activities, and be in contact with teachers and peers; they log in to "live" their lives, and being a teacher or a student is just part of their lives in there.

Designing a course in SL means that the designer/educator will run an educational activity in an environment that is also used by teachers and students as a place suitable for other activities and that information in the designer/educator's profile about who he or she is, groups he or she belongs to, and pictures of his or her favourite places are publicly accessible and will contribute to creating his or her "reputation".

5. CONCLUSION

The research has been developed around the theoretical framework of the cognitive and pedagogical sciences that attribute to the "body" a main value for the teaching/learning process and aimed to verify in which way and with what weight the world's affordances related to the avatar embodiment and his or her faculty to act in the world could affect the e-learning design.

Based on the qualitative analysis of data in both the preliminary investigation (through the case studies) and the subsequent research, the data bring out the immersive and interactive worthiness of the virtual world through a bodily involvement and commitment in different directions.

Primarily the creation, through a 3D body graphical representation, of an online presence that stands out in all the identity values demonstrates that the choice and/or the design of an avatar, with a definite appearance, is a ticklish procedure. The avatar intensifies the effects on communication and the construction of social relationships [33].

But the avatar also has sensory-motor and kinesthetic skills that enhance the online didactical potentialities.

From the experiences and perceptions of the teachers involved in the research as participants, the effect of the "presence" perceived during the teaching/learning activities in SL is clear: the educational/instructional process in the virtual world is online but not "at a distance"; teachers and students are in-world, in a different reality with an attitude that does not suffer from the privation of a physical and relational space.

The concepts acquire shape within the virtual world, a chemical reaction, and a physical phenomenon, but also a story and its time and/or cause-effect relations become "graspable" in the double meaning of the word (concrete/abstract) thanks to the opportunity to activate simulations, roleplays, and explorative paths in space and time through field trips and quests.

The presence of those affordances creates implications for the educational design process and the didactical practices in relation to different aspects:

- the relationship between the teacher and student in terms of professionalism, credibility, and reputation, due to the representation through an avatar and the new communication and interaction modalities that differ from the ones activated in other online learning environments (LMS, blogs, wikis, social networks, etc.);
- the spectrum of technical and relational abilities and competences that both the teacher and the student have to learn to be able to live in the virtual world and be ready to activate an educational/instructional process.

To conclude, the specificity of the creative and social aspect of the environment also requires that the teacher/designer takes into account the progressive world's changes (demographic, sociological, etc.) and technical updates (viewer's version) due to the co-presence and actions of the community of residents while managing the didactical activity.

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