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Engaging students in blended and online collaborative courses at university level through Second Life: Comparative perspectives and instructional affordances

Abstract

Students’ opinions about the degree of impact, status and socio-cognitive viability with the utilization of emerging three-dimensional (3D) computer-generated technologies may vary. Indisputably, 3D technology-enhanced environments have provided considerable benefits and affordances to the contemporary e-Education. In these circumstances virtual worlds (VWs) like Second Life (SL) have generally intensified with an extensive perpetuation and penetration of innovative performances that encapsulated or enacted from the vast majority of Higher education fields. At the same time, there is growing a widespread recognition of reasons affecting the high or low degree of students’ engagement in online and blended course delivery methods held in 3D VWs. Notwithstanding that most notable studies have disclosed SL functional capabilities from a plethora of pilot case studies; however there it is still lacking an experiential-based research approach to determine the degree of students’ engagement in blended and online courses at university level through SL. The present comparative study explores students’ engagement overall as a multi-dimensional construct consisting of emotional, behavioral and cognitive factors. A hundred and thirty-five (135) undergraduate and postgraduate students in almost identical blended and online instructional conditions held in SL took part in this project. Preliminary results have decoded students’ satisfaction for both methods, despite the fact that the voluntary sample composed of different educational disciplines. The quantitative analysis showed that postgraduate students of the online course had more positive results and the degree of engagement was significantly increased compared to those who enrolled with the blended course delivery method. The instructional affordances from the utilization of SL were the collaborative climate between users (instructor and students) that eliminated various intractable boundaries which predominantly observed by several conventional methods. Specifically it was revealed that the online course delivery method engaged more students with the collaborative activities. Educational implications and recommendations for future research are also included.

Introduction

The broad mediation of Information and Communication Technologies (ICT) in different educational disciplines has revealed some of the most important perspectives on cultural and social cognition. Meanwhile, those scholars or educators who contemplate ICT as major sources of cultural invasion are still currently challenged with the view of many technology enthusiasts who are convinced that it has and will continue to revolutionize every aspect of the newfangled world (Zare-ee, 2011). Web 2.0-based technologies as a part of ICT are the most prominent and worthwhile innovations to date, contributing greatly not only to improve students’ outcomes, but also to enhance the pedagogy at all levels of e-Education. The large number of Web (2.0)-based pedagogical methods and models aim to support students on attaining the necessary skills in order to develop a unique “knowledge field” that will enable them to be successful in the 21st century demands.

In the last decade, a novel phenomenon with the conjunction of the Computer Supported Collaborative Learning (CSCL) and Web (2.0)-based applications, such as blogs, wikis, social networking sites, and social indexing tools (social bookmarking) was emerged. Even more
virtual worlds (VWs) as a increasing part of Web 2.0 transactions have heightened both educational and research rounds which importantly claimed as an alternative option for implementing students’ collaborative activities (Dickey, 2005; Park & Seo, 2011).

Relevant studies (Bennett et al., 2012; Chen, Hwang, & Wang, 2012) have also justified that Web 2.0 transactions can increase users’ (students and instructors) abilities and learning opportunities. Web 2.0 has many other dynamic characteristics that are expected to provide a catalytic effect on the entire e-Education (Brown, 2010; Olaniran 2009; Pellas, 2012). Some examples are the following:

a) The radical change of its nature to access users in an innovative field of knowledge.
b) The transformation of learning materials by offering multiple opportunities for constructive, collaborative, ubiquitous, and lifelong learning.
c) The growth-promoting requirements of 3D technologically-advanced environments have radically changed the course delivery method from the strict instructional learning formats (formal or informal) to access into a novel knowledge field with fully online and blended methods and becoming exponentially the most eligible for “edutainment” (education and entertainment) learning approaches in VWs.

The International Society for Technology in Education [ISTE] (2008) has been emphasized on educators’ needs that might enriched the instructional methodology, in order to foster students’ creativity on the one hand and to design and evaluate authentic or contextualized learning workflows through face-to-face (f-2-f) and online educational courses on the other. This has led scholars and educators to rethink or develop novel models and methods for e-Education (Bocconi, Kampylis, & Punie, 2012; Flecknoe, 2007; Marković, Petrovic, Kittl, & Edegger, 2007 Mirabella, Kimani, Gabrielli, & Catarci, 2004; Pellas, 2013; Somekh, 2007) that have a unique design, and besides being adapted to replace f-2-f interaction, still users are able to be in contact and learn together with other peers.

Online and blended (or hybrid) are two of the most eligible and reliable instructional formats. The pedagogical framework of these learning methods can offer users the ability to integrate the advancements, best practices and benefits of traditional learning methods with various Web (2.0) -based technologies and VWs, such as Second Life (SL). In this notion both course delivery methods can provide various learning affordances which become more efficient than the conventional (Pellas, Peroutseas, & Kazanidis, 2013). Within this context, students’ performances are enhanced through the acquisition of the diverse training, whereas in the real life situations the student’s ability to apply appropriate skills and the right knowledge in this particular case are the fundamental requirements.

When compared to the traditional teaching and learning mediums of two-dimensional (2D) systems (blogs, wikis, Learning Management Systems-LMS), 3D (social) VWs and in particular (SL) can offer many advantages, even more than the particular 3D game-oriented technologies (online video games), something that was underlined also by Masters and Gregory (2010). These advantages include the following: (a) students’ participation in virtual workshops, (b) students’ interactions with other users and communicate in a common place as cyber entities (avatars), (c) the reinforcement of the students’ engagement in multiple performances (e.g. analyzing several case studies of experiential learning procedures), and (d) the utilization of various simulations with geometric primitives for teaching specific teaching and learning objects (e.g. constructing visual artifacts from avatars).
Social VWs in the last seven years have drawn considerable attention largely due to their inherent strength in modeling many real world complex systems, which are, otherwise difficult to be constructed by using the traditional existing Web 2.0 tools or LMS. SL as a part of social VWs provides a common 3D persistent multimedia environment that offers to adult users (over 18 years old) the opportunity to co-exist, co-construct authentic or at least pragmatic grids (virtual islets), and to use metaphors of visual objects or artifacts in real-time interactive simulations without distractions. These can assist students to:
(i) Redefine their intentions to determine the most appropriate conditions of instructional purposes in effortful and meaningful ways.
(ii) Transform the social dynamic impression in a virtual community and investigate benefits or boundaries.
(iii) Improve the learning process with dynamic dimensions derived from avatars and designate the effectiveness of an instructional approach.

In these circumstances in order to understand the inspiration of this study, it’s crucial to observe affordances of SL in e-Education, such as:
- The propagation and utilization of SL attained from the exponential growth of Web 2.0 by validating teaching and learning procedures in different disciplines of the Higher education.
- The vast majority of previous studies (Dass, Dabbagh & Clark, 2011; Konstantinidis, Tsiatsos, Terzidou & Pomportsis, 2010; Pellas, 2013) have disclosed the technological capabilities and affordances from collaborative learning approaches fostering the co-construction of an innovative knowledge domain.
- SL can enrich the valuable contribution of constructive or collaborative learning processes via multimedia tools, artifacts and verbal (chat text, VoIP) or non-verbal (gestures) forms of communication.

Given the fact that many universities and institutions have deployed and offered courses in the blended and online instructional formats of e-Education through SL (Beaumont et al., 2012; Childs, Schnieders, William, 2012; Mayrath, Traphagan, Heikes, & Trivedi, 2011; Pellas, 2012; Pellas & Kazanidis, 2012; Wang & Burton, 2012); nevertheless the effectiveness of students’ engagement with both methods is largely unknown. The original contribution that the present comparative research makes valid to study are the growth-promoting factors (emotional, behavioral and cognitive) that may affect student engagement in blended and online courses, which until nowadays have not been examined yet.

The purpose of this study is to determine basic propositions of the beneficial formalization and instructional affordances from students’ engagement (undergraduate and postgraduate) with blended and online course delivery method at university level held in SL.

**Theoretical Underpinnings**

**Contemporary methods of e-Education**

**The online course delivery method**

The online learning is at a large extent a new promising and alternative method that allows users (instructors and students) to access or set their own information sources in electronic forms. The way in which formal or informal requirements of the e-Education with the use of this method reduce the gap between users who preliminary have different cognitive backgrounds and are geographically distributed is today well-established. However the spatial-temporal
constraints from the formation of the online method, and thus the integration of different educational disciplines (adult education, providing additional material at universities) cannot pronounce that each course with the online method can be successfully implemented and bring positive learning outcomes (Hrastinski, 2009; Shea & Bidjerano, 2010).

Concurrently, online learning gives students a basic structure for the course selection mainly in 2D LMS, while also pique the interest of those who wish to further increase their professional or personal advancement. It is also notable to be mentioned the financial benefits that this type of learning can offer by significantly reducing or in some cases even eliminating economic costs. Furthermore, online learning provides interactive communication between instructors and students who are typically distributed in different places, and as result collaboration on activities continue even outside of the classroom climate (Kali, Levin-Peled, & Yudi Dori, 2009).

The blended course delivery method

Many higher education institutions have already offered blended courses with various learning strategies (complimentary with f-2-f) provide sundry advantages over other simpler forms of teaching. While the e-learning setting could not replace the traditional instructional formats, blended learning approaches were launched by using different learning platforms, such as LMS (Burgess, 2010; Dziuban, Hartman, & Moskal, 2004). It seemed that these approaches were able to fill the gap created by users’ presence, in both a natural and an artificial environment, resulting in easier face-to-face communication and interaction with other users.

Dean, Stahl, Sylwester, and Peat (2001) in this vein have shown that the combination of f-2-f with online instruction offers an added value on supporting both learner-centered and collaborative learning. Hence, a blended teaching process does not only use traditional (f-2-f) and distance activities separately, but it is coordinated into an effective method, where users are able to exploit the strengths of both approaches. Likewise, Harrington (2010) stressed that the educators need to be involved in mixed methods as well as to become aware of the benefits from their enrollment.

In the light of these findings, Tselios, Daskalakis, and Papadopoulou (2011) have also shown that the combination of f-2-f interaction with the online instruction format can add value by supporting both learner-centered and collaborative learning processes. Moreover, a blended procedure not only applied to the traditional and distance activities, but also it determined as a more effective approach in which users can get the benefits of collaboration and coordination (Johnson, Top, & Yukselturk, 2011; Voogt, Almekinders, van den Akker, & Moonen, 2005), and in this notion became more satisfied with themselves.

Students’ engagement

In recent years many researchers (Alvarez, 2012; Appleton, Christeson, & Furlong, 2008) have shown renewed interest in order to study the characteristics of students’ emotional and behavioral reactions during the learning process in order to discover the mechanisms that may help students to engage in educational practices and facilitate the knowledge acquisition. Previously, educators and scholars (Finn, 1989; Ogbu, 2003; Skinner & Belmont, 1993) have adopted a two-component model that usually included a “behavioral” factor (e.g. positive conduct, effort, participation) and an “emotional or affective” factor (e.g. interest, identification, belonging, and positive attitude to learning) in an attempt to understand the student engagement.
However, more recent studies (Fredricks et al., 2004; Glanville & Wildhagen, 2007) have compromised a tripartite model that added the “cognitive” factor (e.g. self-regulation, learning goals, and investment in learning), which is more consistent with the learning approaches that take into account students’ basic learning needs such as autonomy, competence, and relatedness.

Similarly noteworthy are the results from a growing body of literature by scholars (DuFinn, 2004; Duran et al., 2006; Shernoff, 2010; Suárez-Orozco, 2009) which suggest that the concept of school engagement is essential in predicting both students’ academic outcomes and dropping out of school. As for the latter, it is significant for students and especially for adolescents who are growing into adults to fully participate before getting involved in a contemporary productive society, both socially and technologically. Hence, promoting academic competence in adolescents is both a complicated and challenging task. In their study for the social relationships of adolescents, Fredricks & Eccles (2004) have argued that adolescents tend to perform better when their psychological needs were met.

Additionally, there is diffusive agreement that students’ engagement affect the social contribution regarding to: (a) the students’ achievements and successes with school’s activities (Kuh et al., 2006), (b) the several benefits that raised from the students’ confidence and satisfaction in adjusting to the school environment (Pascarella & Terenzini, 2005; Zhao & Kuh, 2004), (c) the enhancement of the student’s self-efficacy where students are conscientious and dedicated in the learning course. These can afford mutual characteristics of the development and expression of the creativity, enthusiasm, inspiration and feedback prompt of the students’ actions (Hu & Kuh, 2002).

Summing up all the aforementioned, a framework of “engagement” should endorse the tripartite conceptualization of factors, which was typically described from Fredricks, Blumenfeld, and Paris (2004), and firmly accepted until nowadays as: (a) “behavioral,” refers to positive conduct, effort, and students’ participation in the class; (b) “emotional or affective,” stimulates interest, identification, positive attitudes and values about learning; and (c) “cognitive,” refers to self-regulation, learning goals, investment in learning.

**Engagement in virtual worlds**

In their study, Mount, Chambers, Weaver, and Priestnall (2009) have stressed that “engagement, presence and immersion are highly related terms of 3D VWs that are difficult to thoroughly disentangle and possess some commonality (i.e. the idea that achieving deep levels of engagement and engrossment generally requires a degree of presence)” (p. 54). Users in VWs are engaged in situations that mimic the real world to a large extent, use 3D visual prototyping conceptual concepts as “constructive” tools for gaining meaningful insights, and solve authentic problems collaboratively with others in a common place (Gresalfi, Barab, Siyahhan, & Christensen, 2009).

Some relevant points of the “engagement” in 3D game-based VWs have denoted users’ experiences or interests in order to sustain and expand the popularity with the associated outcomes (Franceschi, Lee, & Hilds, 2008). Therefore, learners’ engagement in VWs can be considered from (McMahan, 2003; Shen & Eder, 2009): (i) the level of interaction with other users that is achieved, (ii) the level of feedback from the virtual environment and (iii) the level of engagement that promoted from various learning activities.
Virtual Worlds – Second Life

VWs are increasingly becoming a potential task of the modern global culture and in fact there is a common conviction that augurs as another social phenomenon. From the beginning of 2006 VWs in general and SL in particular have become an integral part of social networking media (Web 2.0) and educational communities (especially from students of Higher education recognized today as “digital natives”) for the implementation of collaborative learning activities. The functional capabilities of multi-factorial visual applications offer to users a 3D multimedia-interactive environment, where the main emphasis is focused on the co-creation and co-construction of a novel knowledge field. The conditions of the realization for the creation of new “social norms” and learning procedures to empowerment new students' roles in a VW are also complementary with the educational functions that are being constructed.

The “technological infrastructure” of SL gathered on the user’s computer screen a 3D virtual reality (VR) networked system that is common to all users and support the communication or collaboration of geographically (or not) distributed users, over 18 years old. SL is defined as “persistent” because it allows participants to coexist as “cyber entities” (avatars), co-create or co-manipulate metaphors of 3D visual artifacts or simply communicate via multiple forms, verbal (VoIP, IM) or non-verbal (chat text, and gestures), and finally amplify the presuppositions of meaningful educational structures with other peers, in a continuous workflow where it still exists beyond the fact that some users exit from it.

For more than seven years, Universities (e.g. the Open University of the United Kingdom or Ohio University) and Organizations (e.g. ISTE or New Media Consortium-NMC) have utilized and provided with SL alternative expressions of e-learning and blended learning courses, like course lectures, design-based activities or experimental processes, with positive results. The 3D computer-oriented environment in conjunction with the appropriate real-time interactive simulations in a plausible illusion permit users to construct realistic and authentic places, refine rules of the spatial proximity, and overly transform socially the dynamic dimensions in order to improve learning outcomes (Bell, 2009; Wang & Burton, 2012).

Research methodology

Design

The present study was conducted from mid-March to April 2012. The aim of this project was to examine students’ engagement in blended and online experiences in SL. The participants were undergraduate (those who pursued a post-secondary degree) and postgraduate students (those who pursued a master’s degree) enrolled in the spring semester courses at the Kavala Institute of Technology (KIT) in Northern Greece. The research was based on an experimental design and criteria of a quantitative research method.

Purposes and research questions about this study

The purpose of the present study was twofold:

(a) to determine the degree of independence between students’ socio-demographic characteristics (especially on “gender” and “previous experiences with Web 2.0”) with both course delivery methods; and

(b) to elaborate and articulate the extent in which blended or fully online instructional formats have influenced undergraduate and postgraduate students’ engagement (behavioral, emotional and cognitive factors) in SL.
The main research questions (RQ) are as follows:
RQ1: Is there any relationship between the students’ gender, age or prior experience with Web 2.0 applications and course delivery methods (online and blended)?
RQ2: Is there any significant difference on students’ engagement between blended and online collaborative courses at university level held in SL?

Sample
The target-sample composed of 135 students (undergraduate and postgraduate) with 80 (64.4%) participants enrolled in blended and 55 (35.6%) in (fully) online university-level sessions (Table 1). Students have never participated before in online or hybrid course delivery methods held in SL and this was the main presupposition for their enrollment in the present project.

Table 1: Target-sample from blended and online course delivery methods

<table>
<thead>
<tr>
<th>Course delivery method</th>
<th>M</th>
<th>SD</th>
<th>Undergraduate students (%)</th>
<th>Postgraduate students (%)</th>
<th>Overall (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blended (N=80)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21.6</td>
<td>4.14</td>
<td>62 (77.5)</td>
<td>18 (22.5)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>22.5</td>
<td>4.05</td>
<td>12 (57.1)</td>
<td>9 (42.9)</td>
<td>21 (26.3)</td>
</tr>
<tr>
<td>Online (N=55)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21.5</td>
<td>4.32</td>
<td>47 (91)</td>
<td>8 (9)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>22.4</td>
<td>4.21</td>
<td>16 (84.2)</td>
<td>3 (15.8)</td>
<td>19 (34.5)</td>
</tr>
</tbody>
</table>

*The mean scores for the ages of the group that enrolled with the blended course delivery method.

The mean scores for the ages of the group that enrolled with the online course delivery method.

N, number of items; M, Mean; SD, Standard Deviation.

Instrumentation
The construction of the main instrument was adapted from Kong, Wong, and Lam (2009) study that proposed to measure the cognitive, emotional and behavioral factors of students’ engagement. After completing various activities, 135 correspondents from the overall 189 participants of the entire project answered 57 close-ended questions, according to a 5-point Likert scale (1=disagree to 5=strongly agree) questionnaire. The current instrument included also another three open-ended questions about the socio-demographic characteristics. The questionnaires of both sessions attempted to evaluate the following indicators of the three engagement factors with the following dimensions:
(a) the emotional engagement (EE) with 22 items: interest, boredom, achievement orientation, anxiety, and frustration;
(b) the behavioral engagement (BE) with 14 items: attentiveness, perseverance and time spent; and finally
(c) the cognitive engagement (CE) with 21 items: surface strategy, deep strategy and reliance.
Each part of this instrument was translated in the Greek language, took no more than fifteen (15) minutes to be completed, and it was sent to each student via e-mail.
Treatment

Both online and blended courses followed the mutual 7-week university calendar for the same project and of course in the same platform (SL). The content of these research efforts was focused on applications with SL’s functional characteristics that users needed to utilize with the Linden programming language (LSL) in order to construct visual prototypes and scripting objects or artifacts for the construction of a 3D “micro-world” that will allow the experimentation (“learn by doing”) activities without the real-world’s repercussions. The current project had the same objectives for both groups. The current treatment was designed in order to learn and amplify students’ innovative “constructive” processes and affordances from 3D VWs that can be supported for alternative instructional methods, and of course understand how to use these pre-constructed 3D “eco-systems” as reliable and viable platforms for e-Education.

The blended group had a traditional 2-hour weekly class and in SL (in-world) meetings. Students had weekly class meetings (f-2-f) in a computer lab or (online) in-world sessions that changed every second week, according to students’ needs. During the first week particular meetings were in SL (or alternatively one week the meeting was in the computer laboratory and the following was in-world). In the initial encounter problems that existed were about procedures that students should follow for in-world meetings (e.g. making visual artifacts, recognizing the communication tools), and the next class lesson was a discussion of the first results and the formative assessment on this issue.

As for the online group concerns, the teleconference program Big Blue Button (BBB), which had been directly connected with Moodle was used for the first two sessions. In particular, students selected the appropriate link into the Moodle online course and they were automatically connected to the teleconference virtual room. The first online session was an easy and student-friendly process. In the first session the original concepts discussed and the instructor presented SL and tried to provide solutions on how students could interact with it. The other sessions took place through SL. All online courses also attended 2-hour weekly class meetings. The group of online sessions had a 2-hour week class meeting in SL (in-world and at a distance). The first two sessions were implemented via the teleconference program Big Blue Button (BBB), which had been directly connected with Moodle which was previously being used for them as a “warehouse of knowledge”. In addition, students selected the appropriate link into the Moodle online course and they were automatically connected to the teleconference virtual room.

A well-structured pedagogical-didactic framework should prepare students for an open in-world (SL) exploration. The students’ cohesion and coordination in small teams guided initially by the instructor in order to complete a collaborative task and achieve a common purpose. Through exploratory activities by utilizing various multimedia applications and the instructor’s interventions in worksheets, it was expected that students may contribute to a more constructive and meaningful learning process compared to the traditional teacher-centered approach.

Regardless the course delivery method that students needed to follow, they had as a common exercise to utilize interactive tools that endorsed (primitives, artifacts, tools etc.) in SL and they also separated as groups of four, in order to prepare a short report that assessed the pre-constructed virtual environment. Students’ formative assessment was about interactivity issues, visual tools or primitives and the appropriate use of a pre-constructed virtual environment for collaborative activities by using synchronous and asynchronous forms of communication (initial assessment reports). Another characteristic that is crucial to be mentioned is that students were not really familiarized with the utilization of Second Life Scripting Language (LSL), the
available artifacts (materials or virtual objects and tools for scripting and texturing). However with the instructor’s guidance they tried and succeeded to learn. The basic expectation was to initially find information about the construction of a virtual educational island (grid) and afterwards each team to be configured collaboratively programmed artifacts and presented their thoughts, opinions or projects to other peers. The featuring inspiration is to co-construct a grid that can be used for Institute’s lessons.

The instructor’s guidance in the weekly meeting was to encourage students to think, explore, discover and manage the learning materials in order to solve problems and acquire knowledge. Since problems became more complex for learners’ interactions were also become more complex through their participation in a project. The instructor, as the facilitator of this project, tried to help students of both groups at the same time and provide the appropriate feedback in order to avoid students the complex dimensions that a 3D virtual environment can distract them during their introduction. More specifically the instructor had the responsibility to intervene in activities and support students at all stages (fading scaffolding approach) from their introduction to their final activities. After that students had gradually begun to interact with others and gain the appropriate knowledge collaboratively. The main role of the instructor was to drive students on more effective solutions to exploratory approaches of a problem that acquires a more intense and fruitful learning experience.

For a better processing and coordination of the two student groups the instructor decided to structure for each group (blended or online) a specific schedule that students should follow. The online group was composed of two sub-groups with twenty-five (25) and thirty (30) students respectively. The blended group was composed of four sub-groups with a minimum of twenty (20) students in each. For the better coordination of groups the instructor decided to separate each of these groups into undergraduate and postgraduate. The groups were formed by students volunteering to go into one or the other, however there were some cases that had to go into specific groups. For example, those who lived far from the KIT or had to work far away from the Institute, and thus could not attend in-person workshops were placed in the fully online group. In this vein, those students from previous semesters who still had not passed the laboratory course exams and were only obliged to attend the final examinations were also placed mandatory in the same group.

The research was expanded to also include those students from other three different disciplines (Industrial Informatics, Accountancy and Architectural Design) whose mutual course was the “Computer Science and ICT services for e-Education” and wished to study in other instructional formats and platforms as a means to improve and facilitate the acquisition of knowledge. The course was entitled as the “Designing collaborative virtual learning spaces and 3D visual prototyping in Virtual Worlds” focused on the possible use of “Collaboration & Design in Learning” (CDL) processes and results through 3D virtual places and artifacts that can be useful from a larger group of users for various teaching and learning processes.

In the whole process students were involved in online or blended groups and implemented collaborative activities in five different phases of varying length (3-5 days), and each one lasted for about fifty (50) minutes. The content of the study focused on:

i) the co-manipulation and coordination of learning activities with the functional characteristics that SL serves, where students by using the Linden programming language (LSL) scripting objects or artifacts, in conjunction with the “Constructionism” as the main theoretical background;
ii) the co-construction of 3D “micro-worlds” include opportunities for experimentation without real-world repercussions, opportunities to “learn by doing” or “experiential learning” and abilities for students to personalize an environment of future-driven collaborative applications in SL.

Figure 1 portrays phases of this project, in which both groups in different learning situations had the common purpose that was described above.
Figure 1: The blended and fully online learning courses in Second Life
Results

Socio-demographic characteristics

The first intention was to describe the socio-demographic results from students’ e-profiles, as Table 2 summarizes. All 135 members enrolled in blended or online courses and agreed to complete the anonymous (online) questionnaire. Similarly noteworthy all students never before have been taken part in either blended or online groups.

Table 2: Frequency and percentage of the socio-demographic characteristics

<table>
<thead>
<tr>
<th>Source</th>
<th>N (%)</th>
<th>Blended Method (%)</th>
<th>Online Method (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Undergraduate</td>
<td>Postgraduate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>students</td>
<td>students</td>
</tr>
<tr>
<td>A. Previous experiences with Web 2.0 applications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. 1-6 months</td>
<td>32</td>
<td>(23.7)</td>
<td>8</td>
</tr>
<tr>
<td>2. 7-12 months</td>
<td>57</td>
<td>(42.2)</td>
<td>10</td>
</tr>
<tr>
<td>3. More than a year</td>
<td>46</td>
<td>(34.1)</td>
<td>0</td>
</tr>
<tr>
<td>Overall</td>
<td>135</td>
<td>62</td>
<td>18</td>
</tr>
<tr>
<td>B. Student’s status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.1. Part-time student</td>
<td>82</td>
<td>(60.7)</td>
<td>10</td>
</tr>
<tr>
<td>B.2. Full-time student</td>
<td>53</td>
<td>(39.2)</td>
<td>8</td>
</tr>
<tr>
<td>Overall</td>
<td>135</td>
<td>62</td>
<td>18</td>
</tr>
</tbody>
</table>

N, number of items.

Factors influencing the blended and online course delivery methods

To answer in the RQ1, we used the one-way Analysis of Covariance (ANCOVA) conducted to determine the effect of both course delivery methods on students’ personal data when controlling for “gender,” “age” and “previous experiences with Web 2.0 applications”. Of the three covariates, only gender has significantly influenced the online group, F(1,133)=5.842, p<.05, partial η²=.42. Obviously, when controlling gender, students enrolled with the online method were significantly more satisfied with the course rather than those of the blended group (Hybrid, M=3.27 SD=.67; Online, M=3.41, SD=.57). With the gender controlled, the partial eta squared (η²) indicated that the online group seems to have a positive effect on this method. Particularly, η² shows that online course delivery method accounts for approximately 36% of the variance of the dependent variable (Table 3). According to Cohen’s (1988) guidelines this referred to a medium effect size.

Table 3: ANCOVA results of both course delivery methods

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate Gender</td>
<td>1</td>
<td>42.117</td>
<td>5.842</td>
<td>.01*</td>
<td>.42</td>
</tr>
<tr>
<td>Covariate Age</td>
<td>1</td>
<td>7.836</td>
<td>.124</td>
<td>.85</td>
<td>.06</td>
</tr>
<tr>
<td>Covariate “Web 2.0”</td>
<td>1</td>
<td>85.425</td>
<td>1.714</td>
<td>.28</td>
<td>.07</td>
</tr>
</tbody>
</table>
applications”

IV Course delivery method (Blended) 1 45.008 .96 .03* .17
IV Course delivery method (Online) 1 111.521 14.064 .02* .36

*p < .05; DF, Degrees of Freedom; MS, Mean Square Error; IV, independent variable.

Contemporary course delivery methods and engagement

In order to answer the RQ2 the three engagement factors used as dependent variables, whereas each phase of measurement between the two research groups (undergraduate and postgraduate) and the two contemporary methods (blended and online) were used as independent variables.

Table 4 shows that graduate students’ engagement reliability analysis of Cronbach’s alpha has satisfying internal consistency (α=.788). Additionally, in the postgraduate group reliability testing alpha Cronbach was .86, has highly satisfying (see recommendations from Singh, 2007).

Table 4: Students’ engagement reliability indices

<table>
<thead>
<tr>
<th>Engagement factors</th>
<th>N of items</th>
<th>Cronbach’s alpha for answers on undergraduate students</th>
<th>Cronbach’s alpha for answers on postgraduate students</th>
<th>Engagement factors</th>
<th>N of items</th>
<th>Cronbach’s alpha for answers of students that enrolled with the blended method</th>
<th>Cronbach’s alpha for answers of students that enrolled with the online method</th>
</tr>
</thead>
<tbody>
<tr>
<td>All factors</td>
<td>57</td>
<td>.788*</td>
<td>.886*</td>
<td>All factors</td>
<td>57</td>
<td>.767*</td>
<td>.836*</td>
</tr>
<tr>
<td>EE</td>
<td>22</td>
<td>.782</td>
<td>.884</td>
<td>EE</td>
<td>22</td>
<td>.756</td>
<td>.844</td>
</tr>
<tr>
<td>BE</td>
<td>14</td>
<td>.789</td>
<td>.899</td>
<td>BE</td>
<td>14</td>
<td>.769</td>
<td>.833</td>
</tr>
<tr>
<td>CE</td>
<td>21</td>
<td>.786</td>
<td>.888</td>
<td>CE</td>
<td>21</td>
<td>.786</td>
<td>.812</td>
</tr>
</tbody>
</table>

*Cronbach’s alpha requires a reliability of .70 or higher to obtain on a sustainable sample

Both undergraduate and postgraduate groups in blended method considered as equivalent concerning at the level of the overall engagement, even before their intervention to the SL. Independent samples t-tests at the level of significance (p<.05) were not indicated any statistically significant differences \[t(60)=-1.51, p>.05\] in Table 5.

Table 5: Engagement factors of the independent sample t-tests in blended courses

<table>
<thead>
<tr>
<th>Engagement factors in blended courses</th>
<th>Research group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>undergraduate</td>
<td>62</td>
<td>4.33</td>
<td>.36</td>
<td>-1.51</td>
<td>.23*</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>18</td>
<td>4.33</td>
<td>.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>undergraduate</td>
<td>62</td>
<td>4.35</td>
<td>.22</td>
<td>.56</td>
<td>.75</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>18</td>
<td>3.84</td>
<td>.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE</td>
<td>undergraduate</td>
<td>62</td>
<td>4.44</td>
<td>.44</td>
<td>-2.35</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>18</td>
<td>4.28</td>
<td>.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>undergraduate</td>
<td>62</td>
<td>3.98</td>
<td>.54</td>
<td>-7.5</td>
<td>.22</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>18</td>
<td>3.54</td>
<td>.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
On the contrary, Table 6 shows for the online group that the effect on the overall and each factor of engagement between the graduate and postgraduate group after the online intervention was desperate, as independent samples of the t-test betoken a statistically significant difference in favor of the first group [t (45) =4.17, p<.05], [t(45) =4.14, p<.05], [t(45) =4.49, p<.05], [t (46) =5.34, p<.05]. There is a large correlation between the two variables (r=.63), suggesting quite a strong relationship between the overall engagement and the online group, following Cohen’s (1988) guidelines. As well as the CE value (r=.59) has higher levels than the other two engagement factors (CE>EE>BE).

**Table 6: Engagement factors of the independent sample t-tests in online courses**

<table>
<thead>
<tr>
<th>Engagement factors in online courses</th>
<th>Research group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>undergraduate</td>
<td>47</td>
<td>3.63</td>
<td>.26</td>
<td>4.17</td>
<td>.02*</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>8</td>
<td>4.58</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>undergraduate</td>
<td>47</td>
<td>3.77</td>
<td>.19</td>
<td>4.14</td>
<td>.03</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>8</td>
<td>4.54</td>
<td>.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE</td>
<td>undergraduate</td>
<td>47</td>
<td>3.54</td>
<td>.21</td>
<td>4.49</td>
<td>.01</td>
<td>.54</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>8</td>
<td>4.58</td>
<td>.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>undergraduate</td>
<td>47</td>
<td>3.57</td>
<td>.29</td>
<td>5.34</td>
<td>.03</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>8</td>
<td>4.61</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<.05  
EE, emotional or affective engagement; BE, behavioral engagement; CE, cognitive engagement

**Students’ groups and engagement factors**

Table 7 depicts a paired sample t-test between the undergraduate and postgraduate scores for determining the intervention effect on the learning engagement of both groups, which divulged a statistically significant difference in favor of the undergraduate mean scores [t(107)=3.47, p<.05]. On the other side, concerning the postgraduate group mean scores were significantly higher for those of the graduate level [t(14)=6.35, p<.05].

**Table 7: Paired sample t-tests scores between blended and online groups of undergraduate and postgraduate users**

<table>
<thead>
<tr>
<th>Engagement factors</th>
<th>Research group</th>
<th>N</th>
<th>Mean Difference</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>undergraduate</td>
<td>109</td>
<td>-.76</td>
<td>.78</td>
<td>-3.47</td>
<td>.02*</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>16</td>
<td>.52</td>
<td>.35</td>
<td>6.35</td>
<td>.04</td>
</tr>
<tr>
<td>EE</td>
<td>undergraduate</td>
<td>109</td>
<td>-.84</td>
<td>.86</td>
<td>-3.64</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>postgraduate</td>
<td>16</td>
<td>.41</td>
<td>.27</td>
<td>5.34</td>
<td>.04</td>
</tr>
<tr>
<td>BE</td>
<td>undergraduate</td>
<td>109</td>
<td>-.67</td>
<td>.75</td>
<td>-3.59</td>
<td>.01</td>
</tr>
</tbody>
</table>

* p<.05  
EE, emotional or affective engagement; BE, behavioral engagement; CE, cognitive engagement
Also, as Table 8 depicts the comparison of the mean scores between blended and online methods of two subgroups. It was found that there is a statistically significant difference in favor of the blended group \[t(68)=-2.17, p<.05\].

Table 8: Independent sample t-tests scores between blended and online groups mean scores

<table>
<thead>
<tr>
<th>Engagement factors</th>
<th>Students groups</th>
<th>N</th>
<th>Mean Difference</th>
<th>SD</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Blended</td>
<td>80</td>
<td>.36</td>
<td>.24</td>
<td>-2.17</td>
<td>.02*</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>55</td>
<td>.71</td>
<td>.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>Blended</td>
<td>80</td>
<td>.31</td>
<td>.28</td>
<td>-1.47</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>55</td>
<td>.53</td>
<td>.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE</td>
<td>Blended</td>
<td>80</td>
<td>.49</td>
<td>.31</td>
<td>-2.77</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>55</td>
<td>.74</td>
<td>.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td>Blended</td>
<td>80</td>
<td>.33</td>
<td>.31</td>
<td>-1.91</td>
<td>.43</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>55</td>
<td>.57</td>
<td>.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<.05
EE, emotional or affective engagement; BE, behavioral engagement; CE, cognitive engagement

**Discussion**

The purpose of this study was to examine and elucidate the different propositions of students’ engagement in blended and online courses at university level held in SL. This option was based on the statement that learning can affect all users who participate in educationally purposeful activities (Dass, Dabbagh & Clark, 2011; Grenfell & Warren, 2012; Masters & Gregory, 2012; Sajjanhar, 2012). Consistent with Holley & Oliver (2012) results, in the current study SL finally gained students’ attention, because they adequately coordinated and managed their own virtual learning spaces and worked together like teams. According to Krause (2005) suggestions, there are various ways where students can be envisaged through the association of other class members where they engaged equally with other peers or even with the academic staff. On these demands, VWs are more eligible and relevant for students’ demands or needs, rather than other 2D conventional technologies (Wasko, Teigland, Leidner, & Järvenpää, 2011).

Actually, notable studies (Antonacci & Modaress, 2005; Boulos, Hetherington, & Wheeler, 2007; Pellas, 2012) have provided SL capabilities that can be used to foster students’ engagement with more emphasis on their participation in collaborative project-based activities, in order to involve and engage the design and construction of their virtual workflows. Overall, the results of the present study suggested SL as a nascent and innovative virtual learning environment for students’ engagement in various blended and fully online collaborative activities. Postgraduate students in particular may have some previous experience of online
courses, which could help them to become familiar with this method easily. Compared to other well-known LMS, such as Moodle or Blackboard, SL can accommodate better instructional formats with durable communication tools via both verbal (e.g. VoIP and brainstorming-based text) and non-verbal communication (e.g. gestures and IM). In contrast, the findings of Macias-Diaz’s (2008a) study indicated that the online method with SL was more effective and provided better learning outcomes than the blended approach.

The instructional affordances that unveiled from the current research are very interesting. As a result of all the aforementioned, SL as an educational platform is able to:

a) Serve students’ educational needs who live far from the Institute (KIT) and/or work in other places and cannot follow KIT (in-world) appointments which are made in the evenings, even more for those who have finished work and have a freer schedule;

b) Facilitate the learning process in a common 3D virtual environment where all students studied in identically learning conditions with various media sharing devices, visual artifacts or objects (primitives) instructors can sufficiently reduce running costs and contribute to savings of revenue. This is currently important due to budget cuts in this contemporary era which is widely observed with the significant reduction of working hours from the temporary teaching staff.

c) Empower the students’ engagement and learning outcomes in each method, but mainly it was higher for students who enrolled with the online course delivery method. In these circumstances we should underline that beyond the positive feedback from all students about the online and blended courses, both instructional formats were not exclusive or substitute for one another, but can be very complementary in many ways with the conventional.

d) Provide a better understanding of the added value of SL in general, and VWs in general for design-based (collaborative) activities and 3D visual prototyping processes.

**Conclusion**

From the teaching point of view, regarding to the rapid development of 3D technologically-advanced environments, the systematic and practical framework of blended or online learning can become a viable and sustainable solution for Higher education courses. Being familiar with Web 2.0 applications seemed to affect positively students’ engagement with collaborative learning activities held in SL.

The study findings showed that postgraduate students who did courses with online instruction in SL had a significantly higher engagement level than the group of undergraduates who enrolled in blended; this is despite the fact that both research groups were taught the same subject matter by the same instructor. However, after the intervention, in the case of the blended group, the degree of engagement of all three factors diminished significantly, whereas in the case of the online group the engagement level was increased. Furthermore, the postgraduate subgroup of the online course delivery method reported significantly higher points of an overall engagement in comparison with others. Thereupon, it should be mentioned that the online group appeared to have a positive effect of this method among to its gender. Finally, it is indispensable to underline that the instructors’ attention and feedback for newcomers in the first period of the project for both modes was daily. Concluding remarks of the main study that should be obtained are as follows:

- The basic propositions for the beneficial formalization of students’ engagement enrolled in blended and online courses at university level in SL.
• The experiential-based learning in SL may have a positive effect on learners’ engagement and in these circumstances to help further studies identify evidences of which method can be the most predominant method in order to have a considerably better learning process.
• The widespread adoption of a positive stance towards a more innovative instruction with SL that requires from learners to actively engage in the emerging spread of future-driven simulations.

Implications for educational policies that unveiled are:
• SL can represent a relatively innovative generation of 3D virtual learning environment that is potential for the development of constructive and experiential-based activities with an online instructional format.
• SL can be the “next step” of Web 2.0 transactions and not a “Pandora’s Box” where virtual communities can co-manipulate a unique social experience or interact and collaborate with other members.
• Educators and researchers should be concerned about what VWs are best at, and more important to identify collaborative learning-based scenarios that may sufficiently determine the learning procedure and the acquisition of knowledge for students.

Last but not least, some contributing efforts that must be underlined are:
• The expanded analysis of 135 undergraduate and postgraduate students’ engagement who involved in blended or online courses in SL, as in VWs area lacks an empirical study.
• The analysis of dynamic dimensions from students’ engagement that it was offered with the intervention in SL for blended and online groups.
• The comparative study results that emerged from the interrelation between the students’ engagement and two of the most eligible course delivery methods.
• The current study can be suggested to instructors of the Higher education as a guideline to for contacting and organizing educational activities held in SL with two of the most reliable instructional formats.

Limitations of the study
The fundamental limitations which we should be worth bearing in mind when interpreting the present findings were:
(a) the sample size was voluntary and 135 correspondents wanted to participate from the overall 189 (response rate 71.5%);
(b) the subject availability was limited to three months. The study took place in the middle of March 2012 and students may have to devote their time to other university-level courses or have preparations for other workshops;
(c) the students’ characteristics (socio-cognitive background, novice, moderate or expert level in the use of ICT and Web 2.0 services) may differ from students of other universities;
(d) Students’ characteristics may differ from other universities, and the results of this study cannot be generalized.

Future directions
The future research needs to elucidate the engagement factors with:
(a) usable authoring tools for instructors to better monitoring the learning process, and
(b) best design practices for rethinking a meticulous and innovative digital approach in order to reinforce Instructors’ Continuing Professional Development.

References


