Radiology Seminars with Guest Professors in the Virtual Environment Second Life®: Perception of Learners and Teachers †

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Abstract: Nine professors of radiology from six different cities were invited to give a 1-hour seminar in the virtual world Second Life® to 154 third-year medical students from the University of Málaga. Students and teachers performed a questionnaire about the cognitive load that implies receiving/teaching seminars inside Second Life® and several characteristics involving the experience. This experience was considered remarkably enriching by teachers and learners and opens new interesting pathways for educational contact between students and teachers from different universities, with the advantages of reducing costs and travel time.

Keywords: online learning; virtual worlds; training of trainers; medical students; undergraduate education; radiology

1. Introduction

Second Life® (Linden Research SL, San Francisco, CA, USA) is one of the most complex and creative virtual world platforms, with the potential to engage students in learning processes that enhance creative collaboration [1]. Different learning activities, organized by the Department of Radiology and Physical Medicine of the University of Malaga, have been carried out within Second Life® since 2011 and have mainly focused on the perception of students and the impact on their learning [2–5], but there have been no approaches focused on the perspective of teachers. The objective of this study was to explore the teaching of professional Radiologists with none or little previous experience in Second Life® to third-year medical students, during the development of the core course, Radiology, as well as to evaluate the perceptions of students and professors.

2. Materials and Methods

Several professors were invited to participate in one-hour seminars organised between 12 March and 27 May, with the only prerequisite being that they did not work for the Radiology Department of the University of Málaga. As a result, 9 medical specialists in Radiology or Nuclear Medicine from 6 different cities (Badajoz, Cádiz, Córdoba, Granada, Madrid and Málaga) did participate. Only one of them had some previous experience teaching in Second Life®. The remaining eight received prior training to correctly use the main basic functions of the platform (moving, speaking, audio functions, using the camera and the avatar view and controlling the slide-show presentation). The topics, arranged in chronological order, were as follows:
1. Introduction to nuclear medicine: a millennial survival guide
2. Atelectasis: basic aspects for students
3. Advanced CNS image: from form to function
4. Abdominal CT and: what we see in each technique
5. Solitary bone lesion
6. Therapeutic procedures and diagnostic techniques in musculoskeletal radiology
7. A talk of chest and abdominal X-rays: where to look.
8. Radiology of the musculoskeletal system. Pasapalabra?
9. Basic concepts and radiological aspects of solitary bone lesions

Both students and teachers were invited to perform an evaluation questionnaire about the cognitive load (mental effort) required in this activity as well as diverse characteristics involving the experience, the 3D platform itself and the given or received seminar. Cognitive load was measured on a 9-point scale [6], answering the question “How much mental effort does it cost you to function in Second Life, considering: (1) very, very low mental effort; (2) very low mental effort; (3) low mental effort; (4) somewhat low mental effort; (5) neither much nor little mental effort; (6) somewhat high mental effort; (7) high mental effort; (8) very high mental effort; and (9) very, very high mental effort. The remaining items of the questionnaire were scored from 0 to 10.

![Figure 1](image1.jpg)  
(a) Screenshots during the radiology seminars: (a) Aerial view of the island where the seminars were held, specifically on the floating platform over the central area of the island. (b) Scene during one of the seminars given, in which students can be seen sitting in the open-air auditorium in front of the slide show screen while the teacher makes his presentation.

| Assessed Item                                | Students | Teachers | \( p \) |
|----------------------------------------------|----------|----------|--------|
| Cognitive load \(^3\)                       | 3.6 ± 1.8| 4.9 ± 1.6| 0.049  |
| Connectivity to Second Life \(^4\)          | 8.1 ± 1.7| 9.3 ± 1.2| 0.056  |
| The environment of the island \(^4\)        | 9.3 ± 1.1| 9.5 ± 0.9| 0.555  |
| Audio quality \(^4\)                        | 7.9 ± 2.0| 8.9 ± 1.6| 0.164  |
| The experience receiving/teaching this seminar \(^4\) | 8.6 ± 1.4| 9.6 ± 0.7| 0.049  |
| The teacher’s assessment/self-assessment \(^4\) | 9.2 ± 1.3| 7.6 ± 1.8| 0.001  |
| The interest of content for third-year students \(^4\) | 9.0 ± 1.3| 8.4 ± 1.8| 0.189  |
| Assessment/self-assessment of oral exposure \(^4\) | 9.0 ± 1.3| 7.3 ± 1.7| <0.001 |
| The quality of the graphic presentation (slideshow) \(^4\) | 9.1 ± 1.3| 8.3 ± 1.0| 0.083  |

\(^1\) Results are mean ± standard deviation of all given values from both populations students and teachers. \(^2\) \( p \) values from unpaired Student-t test, \( p < 0.05 \) was considered significative difference. \(^3\) The cognitive load was requested on a 9-point Likert scale [6]. \(^4\) The remaining items were scored from 0 to 10.

3. Results

One hundred and fifty-four students attended the seminars: 152 new students (86.4%) and 2 repeating students (4.5%). The number of attendees per seminar ranged between 21 and 39 (mean 28.8 ± 6.2). Seventy-two students attended one seminar, 63 attended two while the remaining
attended at least three. Both professors and students evaluated the experience as remarkably positive and a high percentage reported they would be willing to repeat a similar approach.

4. Discussion

Although Second Life® was created in 2003, it is still little known within the medical university educational area. Second Life® has numerous advantages, two of them being the realistic approach inside the platform, and the ubiquitous perception acquired through remote access. The cognitive load was significantly lower for students than for teachers, which may be related to the intergenerational difference in technological literacy and the adaptability to new forms of communication.

This experience was remarkably enriching for both professors and students. From the students’ perspective, the selected seminars play an important complementary role on their Radiology formation (e.g., expanding their radiology conceptual framework and fixing essential concepts exposed throughout the main core course). In addition, students acquired a sense of professional growth approaching their first medical congress “outside the classic medical school environment”. From the perspective of the invited professors, this project has been a training of trainers experience, allowing them to learn about a new online infrastructure with interesting capabilities of synchronous teaching and compare it (time, accessibility, ubiquity, synchrony, facilities, sound, 3D image, etc.) with the traditional method and other 2D online platforms. This experience opens new interesting and enriching pathways for educational contact between students and teachers from different universities, with the advantages of reducing costs and travel time.

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