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NEMO + 3D, an integrated environment for advanced university teaching

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Abstract

This work presents the design and development experience of NEMO + 3D, the integrated learning environment of the Doctoral School in Neurosciences of the University of Turin, created by the CISI in collaboration with NIT, as part of its E-learning Project: the fundamentals of Neuroscience funded by the Compagnia di San Paolo of Turin. The project's beneficiaries, objectives, methodological and design premises are illustrated. The functional and technological features of the learning environment are analysed, and particularly the characteristics of homogeneity and transparency integrating a web environment, the Moodle platform, Second Life and a number of social networks.

1 Introduction

The Doctoral School in Neurosciences of the University of Turin was created in 2007 merging four existing doctorates - Neuroscience, Cognitive Sciences, Clinical Neuroscience and Psychiatry - and from its outset its objective was to valorize and enrich the experience and skills of students from different disciplines by developing a consistent base of shared knowledge and creating a common language accompanied by the exclusive or prevalent use of the English language.

The E-learning Project: the fundamentals of Neuroscience began with the objective of enriching the teaching activities of the School, by proposing innovative didactic experiments and thereby keeping in line with the indications and wishes of the NENS, Network of European Neuroscience Schools.

NEMO+3D (NEuroscience MOodle+3D), the integrated learning environment of the Doctoral School in Neurosciences of the University of Turin, was created by CISI, Centro Interstrutture di Servizi Informatici e Telematici, of the University of Turin, in partnership with NIT, the University's interdepartmental centre for advanced studies in Neuroscience, and was funded by the Compagnia di San Paolo of Turin¹.

In addition to strictly didactic purposes, the project which generated NEMO+3D aims to shape a valid model that can be extended to other similar experiences. Implementation of the project began in March 2008 and the first checks on its effectiveness will terminate in March 2010.

2 The beneficiaries and their characteristics

The main beneficiaries of the project are around 100 students enrolled in the doctoral course. These are graduates in medicine, biology, biotechnology, mathematics, natural sciences and psychology from Italian and foreign universities. The project is also open to masters students in biological sciences and psychology at the University of Turin and is to be extended to students enrolled in doctoral courses in Neuroscience at other European universities.

A number of the characteristics of beneficiaries and the school have made an impact on the methodological, design and implementation choices of the environment.

The diverse backgrounds of the students mean that they are different in terms of language base, methodological approaches, research instruments, models and outlook on the world (Gallino, 1992, pp.VII-XII). Research activities were carried out in laboratories located in different buildings and contexts. It was therefore thought necessary to utilize solutions to create, in addition to sha-

¹ Further information can be found on the CISI website, <http://cisiweb.unito.it> (checked on the 19th of December 2009).

red knowledge, a sense of belonging and identity, opportunities and instruments for mutual knowledge, communication, interaction and cooperation.

In the collective imagination and in practice, for both students and teaching staff, the fulcrum of the doctorate is research, which is mainly carried out on an individual basis, in different places and contexts. Work was thus done to give didactic value and meaning to the research and related activities and to bring academic scientific communication activities to the teaching environment: seminars, conferences, scientific reports.

The range of action is European and international and thus communication and interaction instruments respond to this feature.

3 The methodological and design premises

The design and creation of NEMO+3D, the courses and online teaching activities contained in it centre around several cardinal principles.

An ergonomic User Centred Design approach was adopted, which focuses on users, their cognitive skills, objectives and the context, and adapts the design of the teaching environment and training resources to the psychophysical demands of users, placing particular attention on usability and accessibility.

The choice was made to guarantee a high level of autonomy for teaching staff and their collaborators in their planning, production, management and delivery of teaching resources and monitoring of the students' online activities (Trentin, 2001). The following are crucial in this direction: the use of technology for the production and delivery of courses that are simple to learn and use; methodological and technical training involving teaching staff and collaborators at different levels and with different content; the methodological and technological support of the CISI staff.

Several e-learning models and methodologies were adopted to respond to the different needs of teaching staff, related to specific didactic problems and different subject content (Ranieri, 2005).

Integrated design and development methodologies for formal and informal e-learning was pursued (Bonaiuti, 2006).

Consideration was given during design to the different aspects of the sustainability of e-learning (Trentin, 2008). Quality control rules defined in the Guida alla qualità dei sistemi di e-learning (CERFAD, 2004) were followed, along with the approach of the SEEQUEL Project, Sustainable Environment for the Evaluation of Quality in E-learning, promoted by the European Commission.

The organisational model adopted was that of identifying the subjects involved – teacher, tutor, head of the School's e-learning activities, interdisciplinary

work group – and defining roles and tasks.

The CISI staff coordinate and organise the logistics aspects of the project, direct methodological and technological training, provide technical and methodological assistance and hardware and software infrastructures, ensure the production of IT material and manage finances.

The didactic impact of the project was assessed using evaluation instruments as an integral part of the didactic process (Trincherò, 2006).

4 The adopted solutions

The NEMO+3D environment integrates various technological and methodological instruments, including a website, an e-learning platform, a 3D environment and social networking instruments, each with specific characteristics and potential and which, when closely integrated can allow the experimentation of innovative teaching solutions.

While the website's purpose is to promote the didactic and scientific activities of the School and its participants, the e-learning platform's online multimedia resources support the School's teaching activities which include: base and advanced courses held by the School common to or specific to each discipline; specialist conferences; seminars held by teaching staff and guest speakers aimed at analysing the state of the art in the areas of research in which the students operate; seminars held by the doctoral students themselves.

Integration between the e-learning platform and the 3D virtual environment of Second Life² has allowed not only the experimentation of new opportunities in the 3D world of resources on the e-learning platform, but especially the experimentation of an immersive environment in which students can take part in lessons, conferences and seminars, create laboratory activities and collaborate in synchronous mode with other students. These activities, as emerges from literature (De Lucia *et al.*, 2009; Lee, 2009; Abbatista *et al.*, 2009), can facilitate communication between teaching staff and colleagues, increase involvement, the sense of belonging to a community and experiential learning.

Central to the promotion of collaboration, the sharing of experiences, ideas, solutions and common and complementary knowledge was the adoption of Web 2.0 communication, collaboration and interaction instruments. Hence, tools for dynamic sharing and involved building of teaching resources available on the Moodle platform (wikis, blogs, forums and chat) were adopted along with social networking tools (Flickr, YouTube, Facebook and Slideshare) which created a virtual gathering space between students and teaching staff, both within and outside of the school.

² For an analysis of the advantages of integrating e-learning platforms and 3D virtual environments see Kemp J. and Livingstone D. (2004).

5 The functional and technological features of the integrated learning environment

NEMO+3D was designed and created to be seen as a unique and integrated e-learning system, despite featuring different technological and methodological systems. The areas composing it are characterised by coherent interfaces which use the Rubik's Cube as a graphical metaphor of complexity and interconnection, analogous to the objects of study of the Neuroscience.

The environment contains training resources, activities and services reserved to the School's students, teaching staff and collaborators, which can be accessed via personal identity authentication on Turin University's Unified Credentials System. After entering their credentials in one of the various environments on NEMO+3D, students and teaching staff can move from one element to another on the integrated environment without having to renew authentication and can access the resources for which they are enabled.

The NEMO+3D system is also open to the outside and provides free access to some of the school's information, teaching and scientific materials as well as allowing acquisition of outside contributions and resources.

The following paragraphs summarise the functions and features of each area of the integrated teaching environment.

5.1 The Web area

The already existing website created with CampusNet underwent a graphics and structure overhaul, with particular attention placed on accessibility and usability, and using multimedia to create interactive pages with a wealth of images, video and audio material.

The site provides information and teaching and administrative services, with free or reserved access, and is aimed at promoting and valorising the following at national and international level: the student's didactic and research activities, via video presentations, multimedia curricula vitae, illustrations of doctoral theses, snapshots of neuroscience; the scientific and teaching activities of the School's teaching corps and visiting professors; the School's scientific communication initiatives, such as seminars, conferences.

5.2 The e-learning area

The NEMO+3D area is configured as a personal environment where students can consult internal and external multimedia teaching resources and use online courses and material, and as a social environment where knowledge and experiences can be shared in forums, chat-rooms and collaboration instruments.

The e-learning area is based on the Moodle platform which is geared towards managing the blended context.

The School's e-learning platform includes the following services: management of the course's administrative activities; delivery of courses; autonomous handling of courses by teaching staff; access to courses by students and tracing of their training activities; integrated management of videoconference software, podcasting, 3D virtual environments. In particular, Moodle integrates into Second Life via Sloodle, which allows direct access to the 3D environment without further authentication, as well as enabling use of instruments, including interactive ones, in the e-learning area directly from Second Life such as chat, quizzes and blogs.

Online courses are mainly based on the SCORM standard (Giacomantonio, 2007) to facilitate long-term continuity, tracing, cataloguing and the reuse of materials.

Several simple-to-use individual instruments were used by the teaching staff to produce multimedia resources, including Authorpoint for the synchronisation of PowerPoint slides with audio and/or video teaching material. More complex didactic objects such as animation and simulation are created by CISI staff.

5.3 The 3D didactic environment

The 3D Campus of the Doctoral School in Neurosciences is created using Second Life over an area of around 20,000 m², and is part of the University of Turin's Second Life Islands where events and scientific initiatives will be organised.

Its first purpose is to create a virtual architectural context to create a sense of identity and belonging. The building is a Rubik's Cube and the choice to organise the spaces in a completely different way from reality, instead of faithfully recreating existing structures in the virtual world, responds to the needs of the project and is in line with other university experiences (Desiderio *et al.*, 2009).

The building covers three floors dominated by large panes of coloured glass. The first floor can be visited by non-School avatars and contains promotional information and can house temporary exhibitions and public scientific activities. Access to the second and third floors requires authentication on Second Life, either via the School's website or directly from Moodle via Sloodle. In this case, Second Life automatically recognises the visitor's identity, represents him or her as an avatar and teleports them to the School's 3D building. The second floor is destined to involve students in real-time collaborative and laboratory activities and consultation of 2/3D teaching materials, resources published on the platform or available on the web (Fig.1). On the third floor

students can view and comment on videos and take part in live or recorded conferences and seminars.

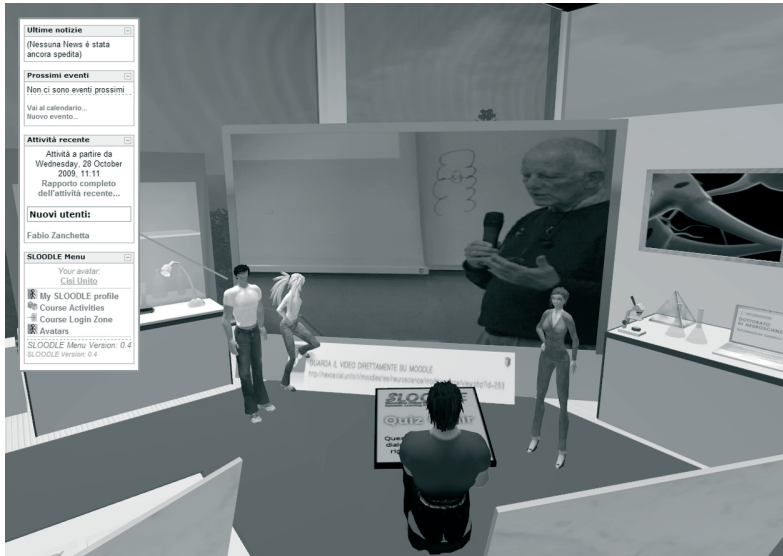


Fig. 1: Synchronous interaction in the 3D environment and Moodle activity via Sloodle

5.4 The social network area

To encourage informal learning and promote the process of construction and sharing of knowledge, instruments were activated within the Moodle platform (wikis, blogs, common areas) along with social spaces specific to the School on Flickr, YouTube, Facebook and Slideshare.

Like others, this area facilitates and supports research and the sharing of resources available on the web produced by other teaching and scientific institutions and by social networks, and students are encouraged to take an active role in contributing to building common and complementary knowledge through the scientific and social networks of which they are part.

6 First results

The use of NEMO+3D by students and teaching staff is constantly growing. Access statistics show a significant increase in use of the website and the e-learning platform, while the 3D and social networks areas are still used sporadically and unsystematically.

CampusNet logs for the period from October 2008 to September 2009 show

that the number of visits, and to a different extent, the number of contacts, files and pages consulted, remained stable until April 2009 (6,519), then underwent a considerable increase of up to 6.3 times in June (41.344), stabilising at 4.7 times in the following months (30,819 in August 2009).

An analysis of the logs for the Moodle platform in 2009 showed a coherent rise in access by teaching staff and students, corresponding to the first compulsory teaching activities. Teaching staff: March 9, April 110, June 522, July 306, August 160, September 41. Students: March 36, June 116, July 2903, August 725, November 198.

The first qualitative investigation conducted using a limited set of open questions on a selected group representing 10% of the students showed a largely positive reception of the ergonomic aspects of the site, with particular appreciation for the presence of information in English and the multimedia resources. Students are satisfied with the online courses and multimedia didactic resources available through Moodle. Students show an interest in but are still little inclined to use the Community area - which, in fact, still receives few visits - where numerous discussion forums are available along with a chat service, a database of bibliographical references, website reference lists, grey literature and teaching and research resources. Despite a few initial difficulties, including technical, in the use of Second Life, students enjoyed doing lessons in that context, communicating with their peers during collaborative activities and taking part in an experiential learning experience and they reported an increase perception of belonging to a community.

Assessment of the impact on teaching is in progress, and as yet, quantitative and qualitative data are not available on the didactic effectiveness of the system.

Conclusion

NEMO+3D, the integrated teaching environment of the Doctoral School in Neurosciences has begun to be one of the instruments used and recognised by a significant number of students and members of the teaching corps, although the number of courses and teaching material is growing at a lower rate than expected, because it is based on voluntary choices, and not on an official obligation imposed by the school.

While the functionality of the website and the e-learning platform are widely demonstrated by use and by the opinions expressed so far, for the moment the didactic impact of the 3D world and social network areas is less clear. In particular, access difficulties from a number of university laboratories have so far hindered use of Second Life, due to university network management policies.

One aspect that remains open is the assessment of the didactic effectiveness of the system, which is currently in progress, and which will be published during the conferences and seminars planned for 2010.

REFERENCES

- Abbastista F., Calefato F., De Lucia A., Francese R., Lanubile F., Passero I., Tortora G. (2009), *Virtual Worlds, do we really need the third dimension to support collaborative learning?* in Virtual Worlds for academic, organizational, and life-long learning, ViWo 2009 Workshop, ICWL 2009, Aachen, Germany, pp. 1-6, http://www.iicm.tugraz.at/home/cguetl/Conferences/ViWo/ViWo2009Workshop/finalpapers/ViWo2009Workshop_03.pdf, verificato il 19 dicembre 2009.
- Bonaiuti G. (a cura di), (2006), *E-learning 2.0. Il futuro dell'apprendimento in rete tra formale e informale*, Trento, Erickson.
- CERFAD (2004), *Guida alla qualità dei sistemi di eLearning*, <http://www.regione.emilia-romagna.it/cerfad/download/Guida2004.pdf>, verificato il 19 dicembre 2009.
- Desiderio A., C., Vitale V., Piccolo V., Esposito G., Faiella F. (2009), *La didattica nei mondi virtuali: esperienze formative in Second Life*, atti del convegno SIE-L 2009, Salerno.
- De Lucia A., Francese R., Passero I., Tortora, G. (2009), *Development and evaluation of a virtual campus on Second Life: The case of SecondDMI*, Computers & Education, Elsevier. Volume 52, Issue 1, January 2009, 220-233.
- Gallino L. (1992), *L'incerta alleanza. Modelli di relazioni tra scienze umane e scienze naturali*, Torino, Einaudi.
- Giacomantonio M. (2007), *Learning object. La progettazione dei contenuti didattici multimediali*, Roma, Carocci.
- Kemp J., Livingstone D. (2004), *Putting A Second Life "Metaverse" Skin On Learning Management Systems*, Learning Communities, New Directions for Teaching and Learning: No. 97, San Francisco Jossey-Bass, pp. 5-23.
- Lee M. J. W. (2009), *Come gli ambienti virtuali 3D possono essere utilizzati nell'ambito dell'apprendimento collaborativo? Un'analisi di casi appartenenti alla letteratura del settore*, Je-LKS, 5(1), 21-30.
- Ranieri M. (2005), *E-learning: modelli e strategie didattiche*, Trento, Erickson.
- Trentin G. (2001), *Dalla formazione a distanza all'apprendimento in rete*, Milano, Franco Angeli.
- Trentin G. (2008), *La sostenibilità didattico-formativa dell'e-learning*. Social networking e apprendimento attivo, Milano, Franco Angeli.
- Trincherò R. (2006), *Valutare l'apprendimento nell'e-learning*. Dalle abilità alle competenze, I quaderni di Form@re, 5, Trento, Erickson.

WEBSITES

Di seguito vengono elencati gli URL dell'ambiente integrato NEMO+3D (link verificati il 19 dicembre 2009):

- Sito web: <http://dott-neuroscienze.campusnet.unito.it/cgi-bin/home.pl>
- Piattaforma e-learning: <http://nexos.cisi.unito.it/moodlesites/neuroscience>
- Campus 3D: <http://slurl.com/secondlife/ResearchLab/218/78/24>
- Flickr: <http://www.flickr.com/photos/neuroscienze>
- Facebook: <http://www.facebook.com/pages/Scuola-di-Dottorato-in-Neuroscienze/57527388384>
- YouTube: <http://www.youtube.com/user/Neuroscienzetorino>
- Slideshare: <http://www.slideshare.net/neuroscienze>