

Virtual Learning Places: A Perspective on Future Learning Environments and Experiences

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ABSTRACT

In this paper, I go through the evolution of the learning environments to justify the need for Virtual Learning Places (VLP). I also describe, briefly, the design principle that are inspiring the development of a concrete realization of a VLP - LIFE - and the open challenge on which we are currently working on: a) the ecological monitoring of the experience and of the experience styles; b) the promotion of a Design literacy.

Categories and Subject description

H.5 INFORMATION INTERFACES AND PRESENTATION. H.5.2 [User Interfaces]; H.5.m [Miscellaneous]; K.3.1 [Computer and Information Science Education]: Distance learning; K.3.2 [Computer and Information Science Education]: Computer science education, Information systems education.

General Terms

TEL, Design, Experience

Keywords

Virtual Learning Environment, Personal Learning Environment, Virtual Learning Place, DULP, Learning as experience, Experience's dimensions, Experience's styles, Design literacy, Ecological Monitoring of the experience, LIFE

1. ONCE UPON THE TIME A KING CALLED "COURSE" ...

Long before "Technology Enhanced Learning" became popular, at the time the "web" had just taken off and everyone was enthusiastic about "e-learning", the technological solutions proposed to realize on-line learning processes relied on the so-called CMSs (Content Management Systems), and were basically identified with them. A fact that indicates how the focus of learning - in this case we cannot use the term "education" - was the *content*. Next step was the substitution of CMSs with LMSs (Learning Management Systems), "familiarily" called *platforms* that allowed to aggregate and organize contents along timelines and paths of sense, i.e. to organize and deliver courses and modules, accompanying

them with periodic assessments and, eventually, evaluations. During the years, such deterministic vision of learning, that perfectly matched with a "corporate" vision of education, seeking mainly to optimize costs and efficiency of the learning processes, produced a plethora of "markers" (called *tags*) aimed to promote a standardized description, representation and delivering of contents and processes [1]. Educators, on the other hands, since the beginning, perceived such vision as inattentive to the pedagogical reasons. For educators, indeed, flexibility is a vital factor, on many different levels: methodological, procedural, of vision, content.

It was during such climate of transformation that were introduced the so-called VLE (Virtual Learning Environment), some of which [2] over time reached a widespread diffusion thanks to the adoption of open-source strategies. Such environments, supported by considerably large communities of developers and users, have met, and continue to meet, needs and expectations that basic stakeholders (e.g. school educators) have about the technological support/enhancements to learning. The reason for this lies mainly in the still limited diffusion of a reasonable level of media, technological and techno-pedagogical literacies that, in turn, results in a preference for tools that allow one to replicate and to amplify activities usually carried on during learning processes they used to deliver face to face. Despite many attempts to update the VLEs with new features that, in the statements of the developers, should serve to support more open and collaborative educational processes, such environments remain basically LMS - centered on the object *course* - whose design and development are guided by the beacons of standardization and efficiency in the delivery of content. Inevitably, such a design philosophy stumbles in the following critical remarks:

- the structure of the platform is designed to create watertight compartments, coincident with the courses/modules, that do not foresee shared spaces; watertight compartments to which the process' manager may aggregate, as attributes of the *module*, all sort of constituent and functional elements which contribute to define a typical learning process: teachers, learners, contents, forum, chat, assessment module, etc. ...);

- relations are asymmetric and favor the maintenance of the roles that characterize traditional teaching processes (e.g. teacher and student);
- lack of efficient mechanisms to share and export content (Learning Objects, LO, have no relevance in the world of informal peer-to-peer exchanges); hence a weak interrelation with the "world" outside a specific training process, due to: i) poor external visibility of the outcomes produced during the training process, ii) a limited time windows within which students have access to contents and activities with a consequent weakening of the learning community, iii) lack of interrelation between different training processes.

From the pedagogical point of view, moreover, the design of the traditional VLE has been criticized [3], especially by those who deal with Life Long Learning, LLL for two main reasons:

- lack of attention to learning as social practice focused on dialogic exchange (including collaborative and cooperative ones) tends to prevent the transformation of tacit knowledge into explicit knowledge and, thus, its transfer/application outside the narrow confines of a given training process;
- the close structure of the traditional VLEs tend to prevent or slow down the construction of the virtual identity of individuals that, indeed, is one of the main objectives of people involved in LLL (and that led to the adoption of instruments such, for example, the e-portfolio [4]).

2. THE REVOLUTION: STUDENTS AS MANAGERS OF ENVIRONMENTS, PROCESSES AND CARRIERS

Over the years we observed an astonishingly rapid transformation in the way people approaches the web and in the social practices hosted in there. Such phenomena are evident at most among the youngest generations [5] and, probably, are producing a modification of their brain-frame and, therefore, way to learn. Among the most evident transformations and trends:

- a) the tendency towards a more limited use of e-mail, due to the heavy "pollution" suffered by this communication channel because of the spamming and to its lack of immediacy in the construction of groups of discussion; unless, then, increase the demand for e-mail notifications to avoid presiding tents of socializing places, many of which are actually desert (the main goal of the greatest part of their inhabitants, in fact, is to appear rather than participate actively to the social exchanges);
- b) a flood of instant communication channels (eg. Twitter) that at present integrate also easy ways to exchange data in real time (Messenger) and/or voice

interaction (Skype); all such communication channels favor a one-to-one emotionally dense interaction that, usually, takes place between members of small communities (easy to create thanks to simple and rapid procedures for links aggregation);

- c) an explosion of blogs and personal websites through which individuals satisfy their need to act as protagonists of the great game of internet, even if, in reality, except for a few cases, everything reduces to the publication of personal diaries written to the advantage of few members of small communities of bloggers - easily identifiable from the list of the linked blogs - and/or friends;
- d) a continuous development of new web services which include, inter alia, a plethora of social systems for publishing and sharing contents - link (de.licio.us), images (flickr), video (youtube), etc. - that have become real "must"; showcases where one should appear and to which one has to refer, for example, from their blogs, often used, right now, as pseudo-aggregators; these social and personal media are causing a so relevant crisis of the traditional ones that nowadays the "strategic planning" departments of the advertising agencies includes in their strategies synergistic use of the social environments ("viral advertisement") in order to boost the effectiveness of their traditional campaigns of "advertisement";
- e) the increasing availability of atoms of information that can be easily captured by special aggregators able to raise their level of dissemination and social sharing;
- f) the widespread use of folksonomies that as spontaneous emergencies (bottom-up approach) represent a valid alternative to traditional ontologies (top-down approach);

The above transformations induced a certain number of TEL's experts to theorize the deconstruction of traditional VLEs to give all students the possibility to build up and manage their own learning environment, content and process. Such position intercepted a diffuse desire for more open social interactions and for a greater independence in determining their own destiny. In some sense it can be seen as a revised version of the naturalistic approach to learning and led to the concepting of a new typology of learning environments: the PLE (Personal Learning Environment) [6], services and content aggregators that can be freely and fully reconfigured by individuals.

Of course, the management of a PLE would require:

- considerable critical skills to be able to select contents and services;
- pedagogical skills to be able to design their own educational path;
- sufficient motivation to respect a self-defined time-

schedule;

- ability to interact socially not only within their own PLE, but also on those of others, to contribute to the collaborative production of content.
- It is quite evident that all the above skills cannot be found all together in a single individual at any age. Perhaps they could in part emerge as a characteristic of what we may define, using an oxymoron, the "collective-connective individual" but, undoubtedly, remain the following critical issues:
- the difficulty to produce "sense" from an ensemble of limited information (such as those derived from RSS) and to filter resources potentially of the same order of the size of the web;
- the difficulty of extracting significant "patterns" from the "chaos" of internet, that may make very hard to manage the trajectories of any educational process;
- the encouragement of what we call "territorial individualism", whose outcome is the production of weak aggregates, or virtual non-places [7,8] i.e. places that have no peculiar characteristics and that may easily lead also to live "non-experience"

Not to be misunderstood, I would like to stress that the production of non-virtual places is dangerous not because it questions the existence of training agencies, but because, it prevents the stratification of the memory. This latter is the process that drives the transformation of a physical space in a "place" [9] where it is worth to live.

The challenge for the future, thus, in our opinion, is not the transition from VLE to PLE, but, rather the construction of virtual "places" that from one hand allow the osmosis of contents and people and, on the other, manage to maintain a high degree of recognizability and attractiveness: i.e. interconnected organisms able to reconfigure themselves, while maintaining their own identity, and to expand into the everyday life, far beyond the boundaries of the "virtual". In the DULP perspective [10, 11] we call such places: "liquid learning places"

3. AN OLD BUT ALWAYS NEW AND ALTERNATIVE PERSPECTIVE: EDUCATION AS EXPERIENCE ... AND ITS STRATIFICATION

In a whatever complex framework the liquidity becomes a dominant characteristic of the system that can be viewed either as a pathological condition [12] or as an opportunity [10] to restart, for example from a renewed attention to the individual, not considered any longer as "user" but, rather, as "person" wishing to use the mediated communication to add "sense" to her/his education through the immersion in meaningful experiences, supported by the presence of a discrete machine.

Refocusing on the individual means recover her/his motivation and putting her/him in a position to develop a critical attitude to analyze the "fluid" in which s/he is immersed, to identify significant relationships that might allow her/him to design her/his own experiential trajectory. It means also to ensure that such experiences can sediment and stratify to make "places", included virtual ones, recognizable. It means, as well, to ensure that all dimensions of the experience benefit of the same level of attention.

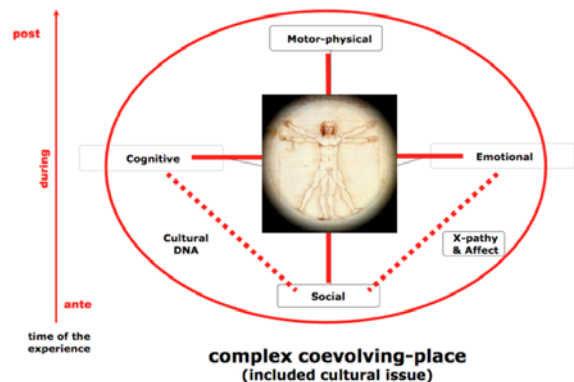


Figure 1 - Representation of the time scale and of the interaction levels involved in an experience

By the way, which are the characteristics of a personal experience (including educational ones) that can be considered universal and meaningful?

We do think [13] that the definition of the multidimensional space of the personal experiences may derive from the integration of:

- a) personal characteristics;
- b) dimensions of the human interaction;
- c) any further dimension that can help to describe, in a manner as complete as possible, an "experience"

"Experiences", indeed, are complex processes based on interactions, or communicative acts, that operate simultaneously on multiple levels, the main fuels being the personal motivation, possibly supported and/or amplified by a general curiosity or specific expectations (grounded in your own mental models).

In Figure 1 we have schematically summarized the characteristics of the human communication that, of course, are also the basis of all activities experienced by the individuals:

- i) the four levels of interaction - physical-motor, cognitive, social and emotional - that when combined may produce further dependent dimensions, e.g. the combination of social and emotional levels produces affect & x-pathy (i.e. sym-pathy, uni-pathy, empathy), while the combination of cognitive and social levels leads to the definition and stratification of the culture, i.e. the codified DNA that makes a place (included virtual ones) recognizable:

- ii) the continuous coevolution of individuals and environment;
- iii) the temporal dimension, either objective and subjective

The equivalence between educational processes and experiences, which has strong historical roots [14], demands also for the identification of a universal process able to incorporate and reproduces the essential features of every kind of activities. To this end we have tried to identify those features that characterize the behavior of all organisms of any degree of complexity; the outcome was the design of the organic processes (OP) [15], a process based on three parallel layer of functionalities:

- explore: the environment to collect information & learn;
- elaborate: the information to design/produce;
- communicate: the "products" by means of "actions" that, in the case of very complex organisms, can make use also of highly structured and conventional languages

The correlation of the descriptive multidimensional space of the personal experience with the organic processes led us [13] to obtain the framework of Table 1 which defines a set of "experience styles" and their relationship with each of the three functional layers of the process.

To the 'explore/learn' layer are associated the perceptual preferences of the individual; for example, the preferences about specific sensorial channels of input, or about the media through which communicate (images, text, sounds, etc.). Each of such preferences, then, may be further detailed by specifying what we call 'exploring styles' (used to visualize images, to read, to listen, to handle, etc.) [16] The first layer of the OP is certainly related to the physical level of interaction and, inevitably, also to the cognitive one, for what concern attention, memory, interpretative strategies, self-control, etc. More or less all these elements involve the emotional level too, and emotions, as well known, affect the sensory inputs also because of individual inclinations toward specific emotional nuances. Actually all levels of the human interaction (see Figure 1) are involved in each layer of the OP although each one at a different intensity, even null sometimes.

To the 'elaborate/design' layer belong personal styles used to process the information (e.g. analytical and sequential or intuitive and global [17], influence of emotion, etc.), to work (active or reflective, individual or collaborative) and to design (abstract or concrete, inclinations toward creativity, divergence and innovation). The prevailing interaction level in this layer is no doubt the cognitive one that can be more or less 'colored' by emotional and social implications.

The third layer of the OP, 'actuate/communicate', can be related to the inclinations of individuals toward extroversion/introversion, combined with their preferences regarding mode of social interaction and

communication that, of course, may partially overlap perceptual preferences (do, say, write, produce images, etc.) and depend strongly on the ability to interact emotionally.

As shown in Figure 1 there is at least one "horizontal" dimension of the "experience" that cannot be neglected in defining the "experience styles": time. The 'ante', 'during' and 'post' of an "experience", regardless of their objective value, are often perceived in a very subjective manner. The subjectivity of the experience shows itself either at the perceptual level (duration of time intervals), as differences in the expectations about an experience and, as well, in its memory. The subjectivity of the time dimension is clearly related also to motivation.

Another cross-cutting dimension of the "experience" is the ludic one, related to the propensity of individuals to play. Although not completely independent of the other styles discussed above, it adds to the overall picture the inclinations of individuals toward 'alea', competition ('agon'), vertigo ('ilinx') and 'mimicry' [18].

Although the one described here is a reasonable framework, we would like, anyway, to stress that the

Table 1

		Experience Styles			
		Interact.			
Organic Process	Explore Learning	motivational info processing, working, design	perceptive (exploring)	physical cognitive interaction	subjective time ludic (alea, ilinx, mimicry, agon)
	Elaborate Design		cognitive emotional, social interaction	creative, innovative	
	Actuate Communicate		extroversion introversion	social, emotional, cognitive	

identification of all the dimensions of the "experience" is still a very open issue.

To conclude this paragraph I would like to underline that the above descriptive model of an experience should be considered as an ideal one because does not take into account constraints/limits that may be introduced by machines/systems that are involved in the mediation of the experience. Indeed only rarely such mediation can be defined ecological, transparent; almost ever the mediation introduce filters that modify the relevance of the various dimensions of the experience. Of course one has to put enough care in distinguish between filters' effect and truly relevance of the experience's dimensions.

4. BUT IN PRACTICE? LIFE

We started to put in practice the above considerations by designing and developing a Virtual Learning Place called LIFE (Learning in Interactive Framework to Experience) [19], with the intention to [20]:

- favor the grow and stratification of the learning "place", i.e. what can be considered as the basis for the construction of the identity and the cultural DNA of a society, although virtual one;
- encourage the development of meaningful social interactions and the co-construction of knowledge, by paying attention to restore appropriate symmetric relationships and equal possibilities in knowledge production;
- support the development of virtual identity and personal growth of individuals, thanks to tools designed to valorize their personal characteristics and, at the same time, their ability to behave as social actors;
- provide simple ways to import, export and aggregate data;
- offer the maximum pedagogical flexibility, in order to support any sort of learning process (included the 'organic' one) and any BC³ (behaviorism, cognitivism, constructivism, connectivism) combination to better fit the needs of any specific context;

Taken for granted the inclusion of those tools that are used in a traditional VLE to manage learning processes and to publish relevant informations (tools that we do not discuss here), a "learning place" (LP) is characterized by the presence of two areas intended to support the development, respectively, of knowledge and of learning communities. These two areas must be closely interrelated because the outcomes of the activities of a learning community can and should be considered as candidates for enriching the cultural stratification of the place. The production of the collective efforts of a community cannot and should not disappear with the end of a given process or, for example, with the retirement of a given teacher. This is why one must provide easy mechanisms for "move" data between the various areas used as repository and/or aggregator of knowledge (e.g. maps, content cards, multimedia archives, etc.) and those areas characterized by more intense collective and knowledge production (e.g. design workshops, joint development of documents, forums, etc.).

At the same time, according to the dictates of the connectivism [21] it is very important that LPs are not closed on themselves but, rather, offer opportunities to expose their history, contents and sometime services - either through techniques of "syndication (e.g. RSS), or by XML markup, or API, or any other kind of future technology - and to import equivalent ones from the net. In fact, although the design and adoption of efficient mechanisms of data import-export is strategic to stimulate the co-construction of the "spirit of place", it is also

reasonable to allow for a rapid access to all those sites that expose important aggregate of knowledge derived by collective efforts (e.g. Wikipedia, YouTube, etc.). To satisfy such need it is important to offer simple ways to aggregate, filter and represent contents. Unfortunately, to date, the standards developed in the field of education do not seem to satisfy these requirements and, thus, the expectations of basic stakeholders and operators of educational processes, and, in fact, are not used. It is certainly an issue on which one should meditate more deeply.

While we are approaching faster and faster a world in which everyone will be constantly connected to the net at a flat rate by means her/his own personal devices, there are still a considerable number of relevant scenarios within which it would be preferable to work off-line. This is why the LP, in the future, should be able also to export some content and services in a off-line usable format from desktops of laptops or mobile phones, through widgets and apps.

Another important aspect of the design for "learning place" is the attention that should be payed to support the personal experience of the place. In particular, it is important to make understand the actors that every act done during a collective activity can also be used to build their own digital identity. It is relevant, therefore, to offer personal environments/corners within which one can build her/his identity with as much as possible freedom and creativity, drawing from what is has been produced by the individuals within and outside the learning place.

At the end of this paragraph is worth noting that, in any case, support for the experiential dimensions lies only in part in the development of ad hoc tools/technologies, since the environment must be sufficiently flexible to accommodate any sort of educational process/experience. The experience is to be largely supported by the design process and its management, as well as by the motivation of individuals. Certainly it is necessary to offer a wide range of possibilities, in order to minimize the technological filtering we were referring to at the end of paragraph 3. For example, in order to promote the game dimension, we have developed a prototype of serious game engine [35]; to facilitate the acquisition of metacognitive skills we have developed a tool to design, also collaboratively, concept maps [22]; to encourage the development of design skills, we developed a tool to run a virtual show & tell [36], etc..

It is my deep conviction that technology should not reduce the educational processes to stereotypes but rather encourage: a) the acquisition of meta-design skills; b) provide tools for self-evaluation with respect to all dimensions of an experience, possibly in action; c) promote personalization and contextualization of educational processes.

To the first two themes are devoted the last two paragraphs of this article, while the third one will be dealt with in future papers to come.

5. PRESENT AND FUTURE CHALLENGE N.1: THE ECOLOGICAL MONITORING OF THE EXPERIENCE AND OF THE EXPERIENCE STYLES

One of the logical consequences of the increasingly complexity of the educational processes, like the "organic" one, is that assessment and evaluation should converge and integrate into the monitoring of the educational experience's qualities.

Being well aware of the objective difficulty to define the relevant qualities/dimensions of an experience and to assign them a corresponding reasonable weight with respect to the learning processes (see paragraph 3), we are, anyway, faced with the challenge to equip trainers, and students as well, with tools that may help them in the quantitative and qualitative monitoring of the activities carried on during such processes. A request that becomes even more stringent in on-line processes which lack multimodal face-to-face interaction.

Luckily, the educational processes mediated by the machine, like those taking place on-line or in blended configuration, generate copious amounts of electronic traces that, when properly filtered and analyzed, can serve to achieve our purposes.

Not by chance, in fact, whatever the tools and methodologies used, a shrewdness of those who design educational processes should be to pay attention that each activity leave at least some traces in a given place. Ideal from this point of view is the forum because it is particularly suited to collect analysis, brainstorming, storytelling, design diaries, etc..

Texts, in fact, are still the most common traces left by the learners during their training and, consequently, text analysis is still the most ecological way to obtain information on individuals, their socio-relational skills, the learning process.

Of course, once that traces have been collected we must ask ourselves what aspects and qualities of the educational experience we intend to monitor and which indicators are the most appropriate ones. This is a very challenging and quite new field of investigation!

In the past we have shown how monitor the cognitive evolution by mean of a quantitative evaluation of concept maps [22]; more recently we have shown that starting from an analysis of the interaction occurred in a forum it is possible to monitor the social and emotional characteristics of educative processes [23,24], by integrating social network analysis (SNA) [25] and automatic text analysis (ATA) [26] ... and the search for

new monitoring methodologies and indicators, of course, goes on.

6. PRESENT AND FUTURE CHALLENGE N.2: DESIGN LITERACY

The acquisition of meta-design abilities requires first of all the spread of a sufficient level of "design literacy" among the new generations. Indeed in a situation dominated by the complexity the ability to design her/his own trajectory is assuming more and more a central relevance in education. As compared to the fluctuations that have characterized the history of education [14] - nature/culture, utopia/pragmatism, humanities/sciences, theoretical/practical activities - the central position of the Design, indeed, can be claimed [27] on many different levels:

- i) pedagogical, for what concerns the purpose of educational processes; the ultimate aim, indeed, should be to enable students to acquire reflective and meta-design skills in order to be able to continuously redefine the design of processes and, even, their own project of life; in other words learners should be able to put into practice the critical method [28] that makes the so-called reflective practitioner [29] a sort of reference model in the complexity of contemporary society – renewing a tradition that from Socrates comes to date [11];
- ii) process level, because the Design enable to respond to complexity by allowing to define flexible processes that can, from one side imitate the organicity of the natural systems and on the other include the iterativity typical of the scientific method; to this latter, the design adds the pragmatic aimed at finalizing modifications of the world (not only its understanding); therefore the design processes are not only problem-based, but also project and process based, i.e. P³BL [30];
- iii) methodological, for the ability to absorb the best of what is expressed by various disciplines and to integrate all within the processes mentioned above; consider, for example, the methodologies derived from cultural anthropology, that suitably readjusted, are used in the process of problem setting; those derived from cognitive science used in the design and implementation of the tests; those derived from engineering used in the medium- and high-fidelity rapid prototyping, etc. [31, 32];
- iv) didactic, as demonstrated by the continuing tension in readapting the methods outlined above and in developing tools and procedures that allow their practical implementation in different contexts and situations, in other words by the effort to be at the same time general and flexible [33, 34];

We wish to emphasize that the recognition of the pedagogical centrality of Design automatically leads to

the need to provide the new environments with tools able to favor the spread of a sufficient level of "design literacy". It is not by chance that the letter D of the DULP vision [10,11] remind us the relevance that the Design is going to assume as cornerstone of the XXI century's education, and that in Life we have started the development of co-design lab.

7. REFERENCES

- [1] <http://www.imsglobal.org>
- [2] See for example: <http://moodle.org>; <http://www.atutor.ca>; <http://sakaiproject.org>; <http://www.ilias.de>
- [3] Downes S. (2005) E-Learning 2.0, eLearn Magazine, URL: <http://www.elearning.org/subpage.cfm?section=articles&article=29-1>
- [4] See for example <http://electronicportfolios.com/>
- [5] Prensky M., "Digital Natives, Digital Immigrants On the Horizon", MCB University Press, 2001
- [6] Wilson S., "Can web service technology really help enable 'coherent diversity' in e-learning?", 2005, URL: <http://www.elearning.ac.uk/features/pedagandws>
- [7] Augé M., "Non-lieux. Introduction à une anthropologie de la surmodernité", Le Seuil, Paris, 1992
- [8] Giovannella C., "From 'Learning Space' to 'Design Place': transforming the present and challenging the future, *Metamorfosi*, N. 62, 2006, 62-65
- [9] Tuan Y., "Space and Place. The Perspective of Experience", Minneapolis, University of Minnesota Press, 1977
- [10] Giovannella C., "DULP: Complexity, organicity, liquidity", *IxD&A Journal*, 7-8, 2009, pp. 11-15
- [11] Giovannella C., Graf S., "Challenging technologies, Rethinking Pedagogy, Being Design Inspired", *eLearn Magazine*, Feb 2010, www.elearnmag.org/subpage.cfm?section=articles&article=114-1
- [12] Bauman Z., "Liquid Modernity" Cambridge: Polity, 2000
- [13] Giovannella C., Camusi A., Spadavecchia C., "From Learning Styles to Experience styles.", in ICALT2010, IEEE Press, New York, 2010; pp. 732-733.
- [14] Cambi F., "Manuale di storia della pedagogia", Editori Laterza, Roma-Bari, 2003
- [15] Giovannella C., "An Organic Process for the Organic Era of the Interaction", in Creativity(cube): Experiencing to educate and design, Proceedings of HCIED2007, Aveiro Portugal, pp. 129-133, ISBN 978-972-789-227-3
- [16] Canale M., Giovannella C., "Observing an image, storing an image", in "Eye Gaze in Intelligent Human Machine Interaction", ACM publisher, 2010, pp 107-112
- [17] Coffield C., Mosely D., Hall E., Ecclestone K., "Learning styles and Pedagogy in Post-16 Learning", Learning and Skill Research Centre, Univ. of Newcastle upon Tyne, London, 2004
- [18] Callois R., "Man, Play and Games", First Illinois, 2001 (1958)
- [19] Learning in an Interactive Framework to Experience, <http://life.mifav.uniroma2.it>
- [20] Giovannella C., "Learning 2.0 ?", in E-learning trasformazione istituzionale e life-long learning. Trento, 2008
- [21] Siemens G., "Connectivism: A learning theory for the digital age", *International Journal of Instructional Technology and Distance Learning* 2 (10), 2005.
- [22] Giovannella C., Selva P.E., Fraioli S., "MapEvaluator in action: a comparative test on the efficiency of the quantitative concept map evaluation in a primary school", in *Advanced Learning Technologies*, IEEE Press, New York, 2007, pp. 566-570
- [23] Spadavecchia C., Giovannella C. "Monitoring learning experiences and styles: the socio-emotional level. In: ICALT2010, IEEE Press, New York, 2010, pp. 445-449
- [24] Giovannella C., Spadavecchia C., Camusi A., "Educational complexity: centrality of design and monitoring of the experience", in *USAB 2010, LNCS 6389*, Springer, Heidelberg, Springer, 2010, pp. 353-372
- [25] Wasserman S., Faust K., "Social network analysis: methods and applications", Cambridge University Press, 1994
- [26] Bolasco S., "Analisi Multidimensionale dei dati." Carocci, Roma, 1999
- [27] Giovannella C., "Beyond the Media Literacy. Complex Scenarios and New Literacies for the Future Education: the Centrality of Design", *IJDLC*, 3, 2010, pp. 18-28
- [28] Adorno T., "Cultural Industry. Routledge", 2001
- [29] Schön D.A., "The Reflective Practitioner", How Professionals think in action. Ashgate, Aldershot (1983)
- [30] Giovannella C., "Design, Technology, Scientific and Humanistic cultures: filling the gap", In *Inventivity: Teaching theory, design and innovation in HCI*. Proceedings of HCIED2006, Limerick, Ireland, 2006, pp. 21-28, ISBN 1874653917
- [31] Moggridge B., "Designing Interactions", The MIT Press, Cambridge, Mass., 2007

- [32] Benyon D., Turner P., Turner S., "Design Interactive Systems. Pearson Education", Harlow, 2005
- [33] Jones J.C., "Design Methods", Wiley, New York, 1980
- [34] Lidwell W., Holden K., Butler J., "Universal Principles of Design", Rockport, Beverly, 2003.
- [35] Alesi D., Campo A., Camusi A., Di Paolo P., Pede E., Giovannella C., "Interaction Design as a serious game", in "Playing with our education", Proceedings of HCIEd 2009, Dundee, UK, 2009, ISSN1477-9358
- [36] C. Giovannella, A. Camusi "Tools for an Augmented Design: quantitative virtual Show&Tell" in "Architecting the future", IxD&A Journal, N.3&4, 2008, pp. 117-124