



## THESIS SUMMARY

Dynamic Hypermedia Device, the interactive mode.

UNIVERSIDAD NACIONAL DE ROSARIO | FACULTAD DE HUMANIDADES Y ARTES



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The research problem presented in the thesis "Dynamic Hypermedia Device Interactive mode" (DHD)<sup>(1)</sup>, focuses on the study of the interactions that arise in the complex plot that is set when we are mediatized/mediated in our communication and production by the current possibilities of the Information and Communication Technologies (ICTs). The scope of the problem lies in physical-virtual contexts of teaching and learning at grade and post-grade degree in the form of workshop, thus its relevance to the mention of the word "Education".

It is worth to note that this analytical perspective is superior than the merely instrumental and the content of this thesis is not set in only one contribution to the development of more and better "educational technology", but it displays an original approach that promotes the development of intersubjective links that are responsible of the different disciplinary requirements that the DHD participant actors can establish. Along with the Bioy Casares<sup>(2004)</sup> sayings we agree that "every machine is in danger of extinction ..." (p. 89)

In the physical-virtual XXI Century context, a DHD could be constituted from the intersubjective plot that "naturalized" the ICTs, creating daily new hybrid interaction habitats, that is why our analysis includes aspects that go beyond technological object itself as technologies not only are interconnected with each other, but also are part of the human social plot, according to Thomas (2008), they are only noticed when they fail or when they abruptly change. The society used technologies and these had irrefutably impacted on the culture "You are a technological being, beyond the fact that you could like or not the idea. Because societies are technologically configured (...) "All technologies are social. All technologies are human." (p. 10)

<sup>1</sup> DHD: Dynamic Hypermedia Device is conceptualized as an heterogeneous net form by the conjunction of technologies and social aspects that enable the subjects to perform with each other responsible actions to research, learn, dialogue, confront, built, evaluate, disseminate, in the modality of a physic-virtual workshop, using the communicational potentiality, open and transformer of the ICTs, regulated, according to each case, by a "contract coordination" (San Martín, 2010, p. 30).

The abrupt change in the technological means is undeniable - remember that only in the 90's the first Internet servers were installed in our country - and this is precisely the reason why if we analyse only the technological object we are almost writing in the sand.

Due to what was explain above is that this thesis, although analyzes the current technologies that support the DHD, it considers principal the complex scheme that includes institutional factors, responsible interactions between subjects and the possibility of teaching, learning and research at the graduate and Post-Graduate level in a ICTs middle/mediated environment.

After a thorough analysis of several implementations, we realized that technology in the educational field is surrounded by epiphenomena, such as modes of use or stereotyped designs, which limit the interactive mode (intersubjective). Thus, we set out to create a dynamic model of interactivity in virtual-physical educational contexts, which enables both, teachers and students, to thoughtfully consider and develop the participation opportunities and responsible production in response to the conceptual design and to the active joint construction of these new complex spaces.

In this regard, we consider the unavoidable need to support the proposal developing areas of training and of specific information diffusion to those who are the protagonists of these processes. With these objective and in the context of this thesis, numerous scientific publications were captured and on the other hand, various print and digital materials to enable the appropriation of the proposal. Then, the development of contextualized and specific materials became a compulsory step for the understanding of a model that aims to overcome the instrumentalism and reductionism in the integration of ICTs in educational processes, which is an emerging problem in the pre-diagnosis of the studied cases.

We are going to state, next, the general objectives, the specific ones, the hypotheses of work and the methodology used to develop this thesis.

### General Objectives

1. To Investigate and define the specificity of the Dynamic Hypermedia Device (DHD) for education and research.
2. To build a theoretical and methodological framework about the DHD interactive mode.

### Specific Objectives

1. To establish the differences between the transmission and the interactive mode of the communication media devices.
2. To diagnose in higher educational institutions about the theoretical assumptions and methodological strategies implemented in the form of a workshop in the physical-virtual context for the collaborative material production.
3. To promote the critical stand of teachers, researchers and academic authorities in the analysis of open source platforms to develop training and research processes.
4. To build a theoretical framework about the DHD interactive mode for education and research.
5. To implement methodologically such theoretical analytical framework in organizations in the of physical-virtual workshop form.
6. To transfer the theoretical and methodological framework developed to teachers and researchers to be use in different contextual situations of higher education, continuum training and informatic tools development.
7. To assess the developments and implementations performed on DHD interactive mode within its possibilities and limitations.

### Hypothesis of work

The hypotheses system that guided this research is:

- The Dynamic Hypermedia Device interactive mode for education and research-DHD-owes its specificity to the possibilities offered by the ICTs to mediate its contents which requested subjective presentiality in their collaborative construction
- The process of building interactivity-DHD for the management, acquisition, production and open dissemination of knowledge, requires that the actors of the socio-technical network can reflex on within a context: 1. the heterogeneity of the components of the device itself as a complex system, 2. the dynamic tensions between the instituting and the instituted in the specific organizational / institutional context regarding the profile of practices, ethical positioning, communication formats, government regulations, applied methodologies and ICTs benefits.

## Methodology

As regards the implemented research methodology it should be noted that the object of study is the result of a construction of the interdisciplinary research group of CONICET-UNR, which works under the direction of Dr. Patricia San Martin and the IUNA under the direction of Dr. Oscar Traversa. Education problems had an integrated approach mediated by technologies from the field of Education and Informatics, which involves mainly, an interdisciplinary approach, in order to avoid unnecessary reductionism.

This work supported for more than 6 years as part of a diverse group of researchers from other disciplines and that has graduate and post-graduate degrees, led a tour partly reflected in this text which dialogically integrates these contributions, polysemy of contributions from different theoretical fields product of discussions and debates on issues of relevance.

The study of the DHD Interactive mode required a deeper analyses on "complex adaptive systems" as a system is considered complex when it is composed of a large number of interacting elements. Then the methodology used understands that the global functionality of a system will not be found if only a few isolated elements are observed, because it is constituted from the interactions. It is because of this that this functionality is called "emergent" as it is only found at the system level (Bar-Yam, 1997). We also know that when these systems evolve they transform their environment, thereby altering the conditions and rules of change, this functional feedback demonstrates its need for adaptability (Gell-Mann, 1995)<sup>(2)</sup>. The emergence of a system can not be explained simply by reduction methods, the decomposition of a system into smaller units can go up to a limit in which there is a new level of emergency, which corresponds to a qualitatively different system. Following Kuhn (1971) and expanding the concept beyond the science case, we consider that external factors become a factor to be taking into account; the cultural conditions surrounding the scientific production cannot be ignored.

We found in the methodology that addresses the problem of complex systems (Garcia, 2007) a close relationship with qualitative guidelines of the Research-Action (R-A) as a methodological model that fits the complexity of the study subject and of our expectation of contextualizing the "reality". The R-A does not isolate the theory of the practice and invited the latter to constitute in a mechanism for reflection (and self-reflection).

Stenhouse (1994) considered that it was good to separate the work of researchers from the teachers work, and this position becomes a key factor for collaborative work with the members of an educational community, which may be proved along the research of this thesis.

The R-A allows the formation of groups that participate and collaborate. Through a self-critic position, they generate an optimization of their own work, generating changes in practice and learning.

Thus, the field work was implemented in heterogeneous scenarios with a large physical-virtual presence of the research team. The first experiment was performed in a private

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<sup>2</sup> An adaptive complex system acquired information not only from its environment but also from the interaction of the system itself and its environment, identifying regularities, concentrating them in a sort of "scheme" or model and performing in this context of application over the scheme basis. This subject was developed in the doctoral thesis "The complex system theory applied to de modelling of the Dynamic Hypermedial Device" from the scholarship Guillermo Rodriguez, member of the research team.

company <sup>(3)</sup>, where we work in an organizational change that would raise the level of the academic offerings of the company and beginning of the production of a virtual campus (currently running).

The second experience was a broader challenge: to work on the implementation of a DHD at the State University <sup>(4)</sup>, which required technology implementations, and, at the same time, methodologies to produce, manage, provide access and preserve large amounts of data in digital format for communities in order to configure, make function and sustain learning, research and productive for the creation and responsible dissemination of knowledge as a common good.

The methodology of interdisciplinary work requires an additional effort of adaptation, agreement and integration where finally, the researchers contributions theoretically and methodologically merge, allowing a deeper and broader understanding of the phenomena that concern us. The members of the Program R & D + T Dynamic Hypermedia Device <sup>(5)</sup> generate an infinite number of interactions that make an influence on EACH OTHER, enriched us and allowed us to bring that experience to our works.

We believe that the original contributions of this thesis are based on the complex view with which it is address the issue of "interactive mode" which includes besides the communication-operative relationship between users and the tools, so-called e-learning platforms, the intersubjective bonds responsible and diverse disciplinary requirements that establish the participating actors of the network that configures the hypermedia device. This multiple approach becomes important because it not only links but also puts in close contact the academic field with methodological strategies for the development of knowledge through technology support.

The first original works were about to weave the main elements that constitute the DHD and consider the singularities of the transmissive and interactive devices and the epistemological domains in which they register.

Next, the interactivity top of the different tools were specified, which required a thorough instrumental appropriation and practice and the development of physical-virtual university workshops. This "top" in the appropriation of the interactive tools opened up opportunities for developments and original implementations in the area.

Beside, the work about the development of qualitative-quantitative metrics is also original. It should be noted that the main criteria have been developed in group with the other research team members.

The developments designed under the supervision of the group of R & D and integrated into the Moodle platform, which was implemented in the UNR Virtual Campus, resulted in an increased of the interactivity online level and make institutional proceedings easier, having a very positive impact on the organization.

Thus the process of writing this thesis was enriched <sup>(6)</sup> until it was finally incorporated in this introduction, six chapters, general conclusions, bibliography and documentaries appendices. Next, there are a synthetically description of each chapter.

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<sup>3</sup> CONICET LINKING TECHNOLOGICAL AGREEMENT with Empresa. Res. Directorio CONICET N° 0022/06 (2006-2007)

<sup>4</sup> Virtual Campus of the National University of Rosario ([www.campusvirtualunr.edu.ar](http://www.campusvirtualunr.edu.ar)).

<sup>5</sup> Accredited by the UNR and the CONICET, based in the International Franco-Argentine Center of Informatics and System Sciences -CIFASIS- (CONICET-UNR-UPCAM) [www.cifasis-conicet.gov.ar](http://www.cifasis-conicet.gov.ar).

<sup>6</sup> The bibliographic references and quotes of this Doctoral Thesis were done under the APA, 5° Edition protocol.

## FIRST CHAPTER

The first chapter investigates and reconstructs meanings about interactivity and interaction that would enable thinking "Interactive mode of the Dynamic Hypermedia Device" in educational settings as the central argument of this thesis. In order to achieve this, we will refer to the senses that are relevant to the construction of our concept of interaction and interactivity, covering synthetically some nodal points that tell us about the interaction in Cartesian physics theories, in sociological, psychological and pedagogical perspectives, such as the implementations located in the city of Rosario, Argentina, which has international high-impact like the experiences of Pichon Rivière<sup>(1993)</sup> and the Active School carried out by Olga and Leticia Cossettini<sup>(Cossettini, 2001)</sup>. As regards interactivity, we will find conceptual perspectives that simplified it to a dual relationship user-software, and others that consider it a communicational plus. Convoled by the reading of a significant number of authors who gave to the interaction and interactivity terms a leading role in the development of his theories or they gave them priority in their pedagogical implementations. After looking through this chapter we summarize that "DHD Interactivity" is an intersubjective responsible mediated link by ICTs that constitutes a socio-technical network. This generates the interchange and bidirectional y multidirectional edition of messages and objects in a collaborative, open, democratic and plural framework.

## CHAPTER TWO

The second chapter presents, briefly, distinctive features of the method called "e-learning" and of "Distance Education" considering the long tradition that this has acquired. It addresses the complex context of physical-virtual education characteristic of the XXI Century and transmissive and interactive devices are specified. The last ones are metaphorically considered as the "sand table" of our century, place of discussion and consensus. Finally, the particular characteristics of a socio-technical network are considered.

## CHAPTER THREE

The third chapter addresses issues related to support DHD technology, the open code prospect "open source" and its ethical stance, the characteristics of relevant educational platforms (their divergences and convergences), the notion of "hypermedia package" and the preliminary design of a metric.

## CHAPTER FOUR

The fourth concerns about the epistemological framework of the methodology implemented in this thesis, the importance of considering the context in the Social Sciences (externalism), the characteristics of the social fact, R-A and the complex systems. The subject's relation to science, their inclusion or denial and the scientific efforts are considered to explain to this elusive subject, to predict him; beside the advance of the science, this effort has not obtained the expected results.

## CHAPTER FIVE

The fifth chapter, refers to the first case, held in a private company from Buenos Aires, this experience was part of an agreement of CONICET Linking Technology, being in 2006 one of the first implementations in the form "researcher" and "scholarship" in a company of our country. As a result the company could set up a new organizational chart and established responsibilities distributed to carry out educational activities in both the formal and informal areas, in various forms in the physical-virtual context with complete autonomy. The consolidation of the management and development teams in each of the areas of effective communication interchanges was one of the most significant changes. There was also integrated in their organizational map, a Centre for Research and Teacher Training with a regulation drafted jointly between founding members of the CONICET and the company, approved in its 31 articles and annexes to be sent to the organization lawyers. However, such a center would depend for full operation of a foundation that should be created to enable the submission of pre-accreditation of the University Institute to CONEAU, but the company within two years of the project implementation, did not formalized the registration of the Foundation considering they had to do further study on this subject for the formulation of the relevant statute.

At the systems level, the organization could have, under the open source philosophy, a physical-virtual multimedia library, a platform in production with intensive use and virtual spaces for experimentation and technology development with two platforms online (Moodle and Sakai in their latest versions) on the pre-production server with total autonomy.

As for the interactive mode, the company could see positive changes in their pedagogical proposals due to systematic in-service training provided by CONICET group to teachers and other personnel about the design and administration of educational virtual environments.

There was a significant progress in terms of the company awareness about the technological, academic and economic organizational requirement that the education mediated by ICTs demands and about what it means to create a Educative Institution profile, consequently they can successfully implement with future students a purely virtual mode Admissions Test, at a national and international level with verifiable benefits for the organization and positively received by stakeholders.

In adherence to the importance that the transfer policies have on the inclusion of the researcher and / or scholarship in other areas of knowledge or production, we believe that it is important to capitalize on this experience as one of the first to be implemented within the country. About what was acquired in this trend, we note that it has given us greater flexibility, quick response to organizational requirements and technological dynamic and comprehensive knowledge in a short term, of the Moodle and Sakai technologies in various field situations that allow a very positive feedback of the theoretical and experiential field to address complex organizational situations. The action research model stated makes it possible, besides, the mutual adaptation and influence in various organizational changes within the agreement period.

The interactivity considered a responsible intersubjective bond mediated by ICTs that goes beyond mere instrumental implementation and, in turn, requires a design that

favours the interchange and bidirectional and multidirectional editing of messages and objects, was widely reflected in the physical- virtual space of the company and was considered for future implementations. The Dialogical exchange became a key factor in resolving conflicts and in creating new opportunities for collaborative work between various actors. It was promoted from the CONICET team a democratic and plural framework, within the guidelines established by the company.

All what was told in the present case allowed us, as an interdisciplinary research group, to face more complex challenges in the context of the public university. The thorough reflection on the experience was a key process that enables us to think the conceptualization of a virtual university campus according to the needs of the Higher Education of the XXI Century. The rapidity of response required by the business environment and the adaption to different organizational realities that we experience in the path of technological linkage project, allowed us to articulate the rapid development of ICTs, the search for proposals and solutions contextualized with interdisciplinary work to solve complex problems. This interrelationship of variables accounts the R & D & T work profile that nowadays demands the issues that constitute the DHD.

Finally what was done was a good supporter of the case "Virtual UNR Campus," That we will present in Chapter VI, where you can see how the Interactivity-DHD model is transversalized in the institutional framework of the Universidad Nacional de Rosario.

## CHAPTER SIX

The sixth chapter describes the construction of a Dynamic Hypermedia Device (DHD) at the Public University, which takes place in the Virtual Campus of UNR, where we conducted a thorough organizational change which intended to reconceptualize the notion of University Campus. The National University of Rosario, UNR, as a higher education institution, offers at high percentage, a traditional form of regular attendance of the community at the various Faculties and Academic Units that conforms it, with simultaneous physical presence of teachers and students at or above 75% <sup>(7)</sup>.

To a lesser extent, in response to demands of greater geographic spread of the qualified transmission and transfer of knowledge offered by the UNR in the various fields of knowledge and promoting higher education and professional training, open and continuous with the scientific and technologic foundations characteristic of pedagogic "distance" mode, there were developed educational proposals mediated by different communication and information technologies depending on the context of the recipients. These implementations are within the framework of the "Distance Education".

Once it was proved the need of having an intuitional area of educational management for the development of projects of "Distance Education" mediated by ICTs, it was established, in 2000 year, by Chancellor's Resolution No. 716/2000 of the UNR, the Multimedia Direction under the coordination of the University Extension Department, with budget assignation for this purpose.

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<sup>7</sup> Law 1717/04 available in <http://www.coneau.edu.ar/archivos/535.pdf>.



Depending on this Department, it was implemented the Virtual Campus "Edupoint" <sup>(8)</sup> with the purpose of created an educational "remote" mode with the support of an informatics and management platform suitable for that purpose and a constructivist pedagogical perspective. In the beginning the election focused on WebCT (USA) commercial development and subsequently, taking into account Argentina 2002 economic realities related to the new license costs per student compared to the peso-dollar convertibility, it was implemented the open source "Ilias" platform from Germany where there were making contextual adaptations, keeping with the development of different educational projects in their different stages until mid-2007.

In the early 2008, the STEyG under existing agreements between the UNR and the CONICET, invited the Director and the author of this thesis, to become members of the Research, Development and Transfer Programme "Dynamic Hypermedia Device - [www.mesadearena.edu.ar](http://www.mesadearena.edu.ar)- (CIFASIS: CONICET-UNR-UPCAM) <sup>(9)</sup> to address a study referred to configuration, administrative and academic management, of interactivity model, performance and function of the UNR Virtual Campus "Edupoint", with the purpose of solving the weaknesses found, of expanding services towards the scientific and technological activity and of achieving sustainability in a growing prospect and to climb to the UNR academic community, of more than 50,000 participants over a period of four years.

Based on findings made and taking into account the experience described in Chapter V (Technological Link project case), we began to develop in the UNR Virtual Campus a profound organizational and technological change process in order to achieve a high level of integration to the present public modality, further development of Distance Learning careers and courses (DL) and provide collaborative spaces for Research and technological link. In this sense, the work project covered four years of a Cyberinfrastructure <sup>(10)</sup> suitable for a high number of users at all levels of the UNR (according to the requirements of the Academic units actual attendance and its Research Centers), through a set of technologies and Human Resources experts who would provide advice and training in a continuous and free way to the educative community, enabling the development and implementation of "Communities" virtual space, Open Access Hypermedia Repository ([www.rephip.unr.edu.ar](http://www.rephip.unr.edu.ar)) and a collaborative environment for Research and Linking Technology (<http://ivt.campusvirtualunr.edu.ar/portal>).

The premise that guided the work claimed that the educational community could do a process of redefinition of the Virtual Campus in everyday practice if many opportunities for its public incorporation were guaranteed and provided such as: immediate and free access, training quality and assistance to researchers-teachers, and students with specific theoretical and methodological frameworks and high qualified open code technologies, friendly, flexible and interoperable. The DHD conceptual proposal could only be concrete following these steps, allowing that the researcher-teachers and participants-students could explore their own meaningful and qualified experiences, implementing co-construction dynamic processes in the actual physic-virtual context, deploying the responsible interactivity.

<sup>8</sup> Geographically found in UNR Rectorate building basement, Córdoba 1814 – Rosario, Argentina.

<sup>9</sup> Program I+D+T "Hypermedial Dynamic Devices". Director: Dr. Patricia San Martín. Settled in the Franco-Argentine International Center of Informatics and System Center (CIFASIS: [www.cifasis-conicet.gov.ar](http://www.cifasis-conicet.gov.ar)) credited by Res. C.S Nº 948/2008-UNR.

<sup>10</sup> About this subject contact: <http://en.wikipedia.org/wiki/Cyberinfrastructure>.

It is desirable that this ICTs redefinition in the UNR community culture practices, enables the sustained design and development of Education, Research and technological link Projects with a deep reflection on what it might be according to each case and purpose, the better balance mediated / mediatization interactive degree. Is in this way how the chances of the processes of formation and development of knowledge generated in the institution would spread.

Today we can, already, see in the "Communities" area, results that account for a user's significant increase (more than 13,000) and the permanent opening of the new subjects of actual attendance careers. It is worth to be note that a group of teachers who accredited qualified performance in "Communities" during the 2008 turn, showing a good level of interactivity, responsible and consistent strategies that enable collaborative learning linked to the precise selection and quality of study materials, were, in 2009, creators of new courses under the "Distance Education of UNR Virtual Campus Program" frame.

A survey was conducted to gather teacher's opinion (who used the "Communities" services) on the Moodle platform, the Virtual Campus function and their knowledge on Hypermedia Repository. The results were favorable about the implementation of the new platform as well as about the services provided by the campus. The survey was anonymous and consisted of open and closed questions.

The 74% of the 45 teachers surveyed regularly consult the website of the campus, where the information of interest related to all areas of the campus and college was showed.

With regard to the information provided by the Campus website, the 16% consider it excellent, the 51% very good and the 33% good.

Regarding the information to request a space in Communities and management through the online form designed for this purpose, the 98% considered it adequate.

Teachers, from the opening of their professorship claim that they understand the post processes to operate the online space; the 88% expressed a favorable opinion in this regard.

As a part of the design of the teacher's online training, a pattern was created to present an easy way of using the tools of the platform. The use of it is optional and it is related to an Open Access book that complements and expands the information about it. The 57% of the surveyed teachers say that they have used the pattern, while the 43% did not use it.

Of the teachers who used the pattern, the 77% believes that it is not necessary that the pattern contains more information against the 23% who think that it could include other materials.

Taking into account the materials that the teachers put up in their space, different types of formats, including videos, are showed.

Considering the tools used it is evident a wide variety of activities organized by teachers, including, messaging (75%), Chats Forums (59%), Tasks (43%),

Consultations (36%), Quizzes (34 %), Surveys (25%), Glossaries (23%), Wikis (18%), Chat (18%), among others. This variety of tools uses showed an adequate teachers appropriation of the platform tools and a design of spaces that exceeds the transmissive model.

As for the interaction with students the 11% of the teachers consider that the virtual environment tools allow an excellent interaction, the 66% consider it very good, the 18% good, the 2% regular and the 2% inadequate which indicates that most teachers consider it a useful and valid tool to interact with students.

Taking into account the UNR Hypermedia Repository, the 45% of teachers said that they know it against a 55% who claim that they do not have this information.

However, the 93% of the teachers surveyed would be interested in receiving information on the UNR Hypermedia Repository.

Besides, the use of Hypermedia Repository from it storing on the production server, in late June 2009, during the period that goes from 1 July 1st 2009 to July 1st 2010 11, the repository has received more than:

- 35,369 visitors
- 124,191 seen pages
- 70.77% of visits are generated from search sites.

The visits included in this period comprise 109 countries. The top ten are:

- Argentina with 19,877 visits equivalent to 56.19% of the total.
- Mexico with 4,311 visits equivalent to 12.18% of the total.
- Colombia with 2,087 visits equivalent to 5.90% of the total.
- Spain with 1,641 visits equivalent to 4.63% of the total.
- Peru with 1,443 visits equivalent to 4.07% of the total.

Google Analytic Tool

- Venezuela with 1,135 visits equivalent to 3.20% of the total.
- Chile with 1,018 visits equivalent to 2.87% of the total.
- Ecuador with 542 views equivalent to 1.53% of the total.
- Bolivia with 399 views equivalent to 1.12% of the total.
- United States 397 views equivalent to 1.12% of the total.

When the RepHipUNR uses the OAI-PMH interoperability protocol generates a visibility in national and international portals, between the main ones there are:

- Registry of Open Access Repositories (ROAR) ([link](#))
- OpenDOAR Directory of Open Access Repositories ([link](#))
- SIU BDU2 ([link](#))
- Universia Library ([link](#))
- List of Argentine portals of open access in Science and Technology Electronic Library ([link](#))

This will generate a high visibility of both the repository and the more than 600 authors that publish their works in it.

The Repository, also has new collections, from which can be named:

- International Franco Argentine Informatics and System Sciences - CIFASIS (UNR-CONICET-UPCAM)
- E-Universitas Journal
- Issues and Debates magazine
- Endodontic Cathedra
- Electronic Journal of Endodontic Rosario
- Endodontic Graduate Career Specialization
- Ethnolinguistic and Social Anthropological Science Center
- UNR – CIUNR Research Council

These new collections were incorporated from April to August 2010.

For the development of careers and courses with a ICTs mediatization percentage higher than 25% in curricular activities (Distance learning mode), there are two options for international high-impact platforms: Moodle: [www.moodle.org](http://www.moodle.org) and Sakai: [www.sakaiproject.org](http://www.sakaiproject.org) and twenty-one active agreements with Regional Offices across the country. This organizational and informatics infrastructure which follow the code and open access (open source, open access), serves the entire educational community of the UNR and those institutions or organizations in association with the university, supported by an academic team, of management, technical and of software development specialized in the area that ensures institutional compliance of corporate quality standards required by national and international subsidies calls for Science and Technology and Distance Learning Programs.

At the technological level, the Virtual UNR Campus, consistent with current institutional policies, is set by renowned open source software in their latest versions, especially designed for developing education, research, production processes with extensive participatory possibilities of synchronous and asynchronous interactivity in the current physical-virtual context. We promote open access to creative intellectual property, the interoperability with academic management systems, and a sociotechnologic architecture that conceptualizes the Virtual UNR Campus in the theoretical and methodological framework of the "Dynamic Hypermedia Device"-DHD-for education, research and produce. As discussed in previous chapters, for this perspective there are particularly important the accessibility requirements to knowledge held by the Argentine public university and the attention to the various national and Latin American realities in the education, research and / or technological Link mediated by ICT field.

Taking into account the objectives of the Plan of Work, what was reviewed evidence that it has been opened a path toward the institutional strengthening of the UNR Virtual Campus through an improved productivity, service and above all a new organizational dynamics based on a responsible and multidisciplinary dialogue approach between all the Campus participants and the UNR institutional context.

The evaluations of the Spain CyberMetrics Lab12 indicate that the UNR has raised, since the second half of 2007 to July 2010, 680 locations at the worldwide level, since in pointed 2007 period it was in the 1822 position and in July 2010 it is

located in the 1,142 position. In Latin America range, in the second half of 2007, it was located in the 78 position and in July 2010 it is located at the 48 place, rising 30 places. At the national level, in July 2010 it lies in the fourth place.

Throughout this biannual journey, Progress work plan evaluative meetings were done where each area and each of the participants were heard when outlining their achievements, difficulties and possible action proposals, developing an effective horizontality and proactive in dealing the issues. This activity had never been done in the previous administration and it was very beneficial for the consolidation of the group, for the building of an interactive-intersubjective link and the clarity of the joint action: the responsible construction. It was significantly then, the genuine interest that was generated by the activity of "the other" and the awareness that the problems we addressed were complex as they were enmeshed in the presence and commitment role of the different actors of the organization.

Nowadays, the academic offerings, in the Careers and Courses space, were markedly increased, incorporating courses proposed by professors from the National University of Rosario. The drop that, previously, was recorded a high rates was gradually decreased and it impacted in a greater number of graduated students from the given careers.

Hypermedia Repository spreads the work of more than 600 authors, under the Open Access philosophy and has increased its visibility nationally and internationally.

The space community has over 13,000 participants, providing a physical-virtual swap space, which is valued by the teachers and students of the institution.

The "Web Mundial University Ranking" is a Cybermetric Lab initiative, which belongs to the CSIC (Scientific Investigation High Council. SIHC), the highest national Investigation Center of Spain [http://www.webometrics.info/top200\\_latinamerica\\_es.asp](http://www.webometrics.info/top200_latinamerica_es.asp)

Finally we will arrive at the general conclusions of this thesis, where it will briefly set the work prospective

## GENERAL CONCLUSIONS

Located in the XXI Century physical-virtual context, this doctoral thesis defined the specificities of the Dynamic Hypermedia Device-DHD- mainly addressing issues related to the interactive learning mode in educational high level and professional training environments. In this complexity, social, institutional and technical, spaces are articulated which exceed the discipline approach, therefore, an interdisciplinary methodological framework was used for it was considered the most appropriate for its treatment. In this sense, what was exposed shown a collaborative group work, done mostly with the members of the interdisciplinary program of R + D + T "Dynamic Hypermedia Device."

The thesis first investigated about conceptual dimensions related to the terms interaction and interactivity establishing substantiating theoretical differences. This need appeared after realizing that, generally, in the publications related to the ICTs applied to education, interaction / interactivity is often used interchangeably regardless of underlying paradigms and without recognizing when and how the interaction term is presented in various fields of knowledge with an historical background extensive to several centuries. Also, about the interaction term, it was made a qualitative distinction between purely transmissive definitions and those that arise from more constructivist perspectives. Finally, a concept of interactivity-interactivity-DHD-that accounts for the dimensions that comprise the DHD was proposed, as a complex system, and the problems of its performance in organizational / institutional Higher Education context. This purposive construction is constituted in the original contribution of this thesis to the range of the application field studied, to the DHD theoretical and methodological framework and responds to an unavoidable necessity of deepening the interdisciplinary dialogue that the integration of technologies, research and production to educational activities issues request. Finally, this contribution enables to think in the social and technological side that support an ethical stance towards the spread of an open and plural construction of knowledge in the public context.

For the research purposes, it was necessary to deepen about the notion of device, for then distinguish transmissive devices from interactive devices, being the communicational plus and the possibility of editing the distinguishing factor of the latter. The device, in its transmissive mode, is characterized because it does not enable the dialogue path or information return. We do not considered it to impede the construction of social knowledge but that the support does not enable bidirectional or multidirectional messages that enable the communication return mentioned. It is important to mention that this notion of transmissive device should not be confused with the mere dissemination of information, as we would be denying the role it had historically played in the social construction of knowledge. It is undeniable that transmissive devices such as books and films had become important disseminators of valuable cultural events. And then is the work, what gives identity to its own support, in the words of Blanchot (1992) "the statue glorifies the marble" (p. 211), precisely because is in the work where the author's subjectivity is involved, providing entity to the support that materializes it, which becomes a communication plus. The interactive mode that allows the DHD, enables infinite creation of works an endless works, constantly changing in a continuous temporal synchrony-diachronic: when we just started this journey marked by the "interactivity" processes. The "materiality of the virtual" which is a support that gives visibility to the work, becomes a critical factor since it allows the return of data to the

author (impossible issue in other supports cases). What is printed, for example, does not exclude that different interactions can be generated around a literary work (debates, dialogues, various publications, etc.), but the technological limits of the support cannot account for these events done by others in continuous time: Interactivity-DHD processes cannot be generated.

Therefore, the interaction is independent of the digitization of content, also interactivity-DHD owes its specificity to the possibilities offered by ICTs to mediate, republish reedit and edit new content applying in its dynamic construction of our subjective presentiality.

The "sand table" metaphor in education and research environments, proposes the inclusion and dialogical interchange as constitutive pillars. This metaphor refers to cognitive development as a social, relational and interactive fact: a process by which humans beings construct and develop their cognitive and ethical recognition to the other, to the extent that they keep on building the context where they apply them. Thus, the use of developed technology allows the construction of concepts and the implementation of perceptual inferences that facilitate cognitive development and of new capabilities. In turn, the historical experience of the "sand table" as a technology of the Active School as part of what is documented in the Olga and Leticia Cossettini Archive, is established as a invaluable patrimonial precedent that enabled to design and develop the concept of interactivity proposed here.

From there, "Interactivity" and "DHD" are terms that are constituted in tension, in the same way the point de caption 13, , where there are interdependent terms, do. This field of tension forces is dynamic, due to their mutual dependence, the DHD form part of the interactivity to the same extent that interactivity form part of the DHD. Through the presented cases, it was possible to demonstrate the complexity required for the development, administration and maintenance of a collaborative space for the acquisition, production and dissemination of knowledge, which qualitatively differs from the mere administration, management and communication of information, although, it included it, other dimensions are enabled that exceeded the informational.

The construction of the DHD interactive mode, make it possible to think the encounter with the other, with its otherness, as a key factor to avoid perpetuating "What is always equal to itself." Following Levinas <sup>(1974, 1993)</sup>, otherness ethically challenges us; is the other who when challenges us allows responsibility as the ability to respond from our subject status; human relational situation that does not support any object-substitution: the great advances in informatics can simulated but never challenged. In turn, being able to receive the interpellation of another, leads us to be open to a "here I am." This human consistency exceeds all technology, timing and physical positivity and in reference to the educational act or research, it only makes sense based on its subjective presence.

Therefore, those concepts that consider interaction as a relationship that binary wear itself out between the user and the "intelligent" software, are quite reductive. The DHD-Interactivity enables subjects to deploy their subjective presentiality through interchange and work production in the physical-virtual context; this is an issue that confronts with dubious quality educational models which reduce knowledge to mere



information and this one to goods, where the priority is the reproducibility as a criterion for cost amortization based on a process of

Point de Caption Buttons that support upholstering stuff, causing tensions and forces, industrialization of knowledge, unaware of the value of the intersubjective encounter and the uniqueness of the educational act. Returning to Kusch <sup>(2000)</sup> we adhere to the fact that we cannot be without actual being, therefore, the teachers and / or researchers being cannot be detached from the word of others, the role is established in accounting for the subjective presentiality, a social construction that dynamically re-released on the uniqueness of each work (in both, research and educational processes).

Through the presented cases we have observed that in the XXI century context, the construction of DHD is not organizationally implemented for the only reason of renewing technology, of having certain economic resources or expose political will. Current regulations, customs and habits, roles of actors, information feedback loops, require a gradual and consensual organizational change, which are always slower than technological solutions. The subjects, gradually, begin to experience the difficulties and tensions from a closer perspective while they become or not engaged on an active participation. The organization, the discourses at play and the methodological aspects in their multiple levels and goals are the key dimensions to consider when analysing the construction process.

In light of the above, the implementation of DHD for education and research requires making a balance set of "the instituting" and "the established" with the intention of adapting the roles of actors, the institutional rules and the organizational culture to the possibilities offered by the new physical-virtual context of the XXI century. Returning to Pichon Rivière <sup>(1993)</sup> we observed, in the presented cases, that this organizational change process was not without anxieties: links and practices were abandoned, and they were regenerated through the "doing" of the actors. In the accomplishments path, the construction of DHD is not conceived as an immediately technical solution but as a diagnosis path, of dynamic strain with a practices and permanent dialogue context, where the purely technological aspects are interwoven with subjective, organizational, legislative, academic and social aspects which express the highest conditionings.

The technological limitations analysis was made from this approach; it is showed in certain educational platforms, such as lack of contextualization, of metadata, and the absence of activity records that might account for the processes of interactivity. Faced with these problems it was proposed, as an original interdisciplinary contribution, the design of a metric that includes several key factors, making it possible to obtain results that tend to focus on the qualitative of the interactions and not to focus, only on the quantitative factor. This formalization enabled the design and development of an experimental graphical software presentation of complex interactions, which we call "SEPI-DHD."

In the taken actions, the organization actors training was a key factor of the proposed methodology, considering not only the various aspects of online designing spaces due to the generation of DHD- interactivity and its use context and also the knowledge and exploration of instrumental possibilities that technological tools offered. Therefore, we argue that interactivity is not an epiphenomenon of technique or involved technology, but that it requires a specific appropriation done by the actors and a logic use which



incorporates innovative features. The UNR Virtual Campus Communities and other projects experience undertaken in the DHD framework have opened a truth way of reflexion in a number of teachers on how curriculum resize current graduate and postgraduate courses of the traditional actual attendance modality, with the given possibilities of the current physical-virtual context, displaying what was proposed here.

It is worth noticing that through various field activities we enlighten a position that promotes a better quality for public education, enabling the publication of various didactic, scientific and technologic materials and joint production spaces of knowledge due to the Open Access philosophy in order to generate a free path of dissemination and publication of intellectual property and encourage discussion processes open to the community beyond the institutional framework of the UNR.

Taking into account the technological solutions proposed in the various educational organizations and in relation to the informatics aspects of the DHD, they were adapted to the contextual situation of developing countries, configured as sustainable options, both economically and technologically, in the long term. It was sustained and recommended in all cases those known quality developments of high global impact under the open source perspective. These issues were clearly substantiated both theoretically and through the implementations made in the field.

As a prospective way, we considered it necessary to continue the actions towards an open and pluralistic public education in the current physical-virtual context, and we invite you to reflect on the possibilities and limitations of building open and collaborative knowledge in science through science and Technology agencies, universities and links with various organizations. Beyond the results of communication in articles, books and other means of publication, it would be desirable to have full access to vast collections of data and intellectual property in general, the interconnection of research topics through physical-virtual networks, the speed in the search of results, among others, as essential factors that contribute to a smooth and flowing discussion among members of national and international scientific community, so necessary for equity in developing countries context.

Finally, we state that an Information and Knowledge Open Society can only be possible if interactivity can be thought and lived as a subjective act of presence. This is why the theoretical and methodological framework of the DHD interactive mode promotes in its development an encounter with the other, with their otherness, enabling the responsibly act and the dissemination of what is constituted as an open-work - to the participation, the dialogue, the multiple points of view- to the possibility of citizenship building in the difficult physical-virtual context of the XXI century.

The DHD interactivity enables us to move away from the infinite reproducibility of the "always equal to themselves," ultimate expression of the refined technological artifice that daily cloned barbarism.