

# Use of Social Networks and Complexity for Enhancement of Academic Learning in Supervised Internships: An Internalization by Doing

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## ABSTRACT

This paper presents the initial study of a methodological approach called "Internalization by Doing" with the purpose of providing a Complexity environment for academic learning in supervised internships as part of a doctoral research. This methodology is aimed for the use of a Digital Social Network to promote Paths of Complexity such as recursivity, retroactivity, systemic view. The open source framework Elgg was used for the development of Digital Social Network. The results show it is possible to obtain significant gains for academical and practical learning in supervised internships.

## Categories and Subject Descriptors

K.3.1 [Computers and Education]: Computer Uses in Education – Collaborative Learning

## General Terms

Management, Design, Experimentation, Human Factors, Theory, Verification.

## Keywords

Collaborative Learning, Digital Social Network, Complexity, Supervised Internship

## 1. INTRODUCTION

Currently, the need for a professional with entrepreneurial and innovative skills in the Management area leads to relations of exchange between teachers and students in academic environments. This arises the need to see student as a restless being, eager to learn – an individual who has the potential to act proactively, and responsibly in the learning.

For this reason, it is necessary that students know that the quality of a course is not given exclusively by the physical and academic infrastructure of their educational institution, but also by the commitment they have with their academic environment (Andrade, 2003)

Part of this process, in Management undergraduation courses, takes place, in its fullness, in the academic stage of Supervised Internship – a period of practical studies to foster learning and experience in which students have an academic oversight, review, correction and attentive examination of practical activities. (BIANCHI *et al*, 2002)

After an empirical academic experience of 12 years as coordinator of a Management undergraduate course, author Mansur observes that, regardless of how meaningful the academic experience of supervised internship is, this experience is often not lived in its entirety by those students, since academic learning models are based only in the Cartesian concepts proposed by Descartes.

The dependence on these models in education can be explained by the evolution of the western thinking, and the industrial model proposed by Taylor, Ford and other thinkers and business men of the early 20th century that brought into the industrial production world ideas such as specialization, serial production, and production lines. For the implementation of these concepts it was necessary to incorporate Descartes' concepts which resulted in a myopic and fragmented vision of the productive process.

As a consequence of these changes, universities adapted their pedagogical models to meet new market needs. Thus the systemic view of workers in Craft's production model was lost by a gain in efficiency in the operational aspects due to the need to meet the increasing social demands. Eventually these changes shaped the profile and way of being of the emerging society of the time. (CHIAVENATO, 2004).

In Educational contexts, despite the fact that many institutions and teachers have disseminated the theoretical concepts of Complexity, classroom practices usually adopt a Cartesian linear pedagogy. This finding demonstrates the disparity between academic theory and practice in the classroom. (BRECAILO, 2007).

Besides this disparity, it is found that the pedagogical model for Supervised Internships are guided by Cartesian premises, providing a learning process that happens in a departmental, focused, and static form. Therefore, it is a model that does not reflect the learning needs of the student's professional profile – a

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dynamic individual with decision-making skills able to relate the understanding of the theoretical and practical relations of his professional life. (AMÂNCIO *et al*, 2006).

Thus, in addition to the current models adopted for supervised internship that do not consider the assumptions of Complexity, little change has been seen in these academic models since the CNE / CES 067/2003 law, which regulated the first issue models for Supervised Internships in Brazil.

We can question if the reason for these asynchronies comes from the effectiveness of this model in relation to educational goals, or from a lack of proposals suited to these new paradigms.

From an academic and social point of view, it is possible to make some reflections about the advantages of adopting pedagogical practices that consider Complexity paradigms such as new technologies applied in Education – Digital Social Networks that prioritize Collaborative Learning and sharing of knowledge, for instance. The adoption of Digital Social Networks as a virtual learning environment are in accordance with the social trend of collectivization that promotes personal and professional behavior of network connections (Harvey, 2003)

As a result of this, the present research.. It must be pointed out that this paper is the first part of "Internalization by Doing", the methodological approach proposed by Uebe Mansur (2011a). This is based on the Ecosystemic Methodological Development for Researches under Complexity by Moraes e La Torre (2006). Under this perspective, it is not possible to begin a research in Complexity environments without an experimental and groping moment, because there is not an established path where the research or the researcher can follow, only movements that overlap, complement, and add infinitely. As stated by the Spanish poet Antônio Machado: The path emerges as you walk it.

This paper presents the development and initial results of a Doctoral degree research which used, as field of study, an undergraduation course in Management at a private university in Campos dos Goytacazes, RJ, Brazil.

In Brazil, Management undergraduation students can enrol in two kinds of internship:

- *Required academic internship* - usually developed in a special academic moment in the subjects of the course . In this kind of internship, the student has two supervisors: an academic supervisor from university, and a supervisor from a company. This academic stage usually takes place in the last two undergraduation semesters.
- *Non-required internship (apprenticeship)* - Designed to meet a student's professional objective, requiring no pre-determined period for the experience. As there are many companies offering work positions, students have the opportunity to start his/her professional experience early in academic life.

For this research the focus is the required academic internship in the last of the four-year course. Each academic period is split in two semesters, and in the last year the student has the opportunity to do Internship I in the first semester and Internship II in the second.

The paper opens with a brief explanation of the concept of Complexity, its paths, as well as the relations between Complexity and Education. This is followed by an explanation of the ReSa

Doctor degree project. The Methodology section presents the Supervised Internship model originally adopted, and the changes observed in it during and after the experiment. The paper brings both the results and conclusion of the present stage of the experiment.

## 2. COMPLEXITY AND EDUCATION

Capra (1996) proposes a view of the world as an integrated system, not a puzzle hose with pieces that need to be embedded. This line of thinking is a counterpoint to Descartes' model in which it is necessary to fragment, split and isolate the parts is necessary to fragment, split and isolate the parts with the premise in order to understand the whole.

From this, Morin (2006) proposes a much broader concept related to the necessity to have a holistic vision about a subject, abolishing the "absolutism of truth", and considering the unpredictability in biological, sociological, anthropological and planetarium contexts.

This new concept, named "Complexity" by Morin, cannot be confused with "complicated" and should be understood as "(...) what is woven together" (Morin, 2000, p. 207) in direct reference at the latin word "Complexus". This way of thinking is established through a perception of various concepts such as: interdisciplinarity of complex adaptive systems, emergent behavior of the system, the network complexity, chaos theory, behavior of distant systems, thermodynamic equilibrium, and ability to self-organize.

Morin (2006) and Brecailo (2007) list some paths that can characterize Complexity:

- *Systemic Path* – which brings an opposite conception to the Reductionism of Cartesian Thinking, that is, the idea that the whole should be fragmented in order to be understood;
- *Hologramatic Path* – which establishes the idea that the part is in the whole, but the whole is also inscribed in the parts.
- *Retroaction Path* – which sets the idea that causality of phenomena and facts is not linear, that the cause affects the effect, and the effect affects the cause.
- *Recursion Path* – which defines that the products and the effects are producers and catalysers of what produces them, setting a status of self production and self evolution of living systems.
- *Self-eco-organizational Path* – which states that, in the context of recursion, there is a dependence of the individual - *autos* - for his/her environment - Ekos – due to the need to extract energy, organization and information from it. This principle shows the inseparability of the individual and the ecosystem;
- *Dialogical Path* – which includes the possibility of principles or concepts that are conceptually antagonistic, but are contextually inseparable. This idea establishes a dialogical notion of order / disorder / organization of organizational structures. This path enables the individual to rationally associate contradictory notions in the conception of the same Complex Phenomenon;

- Reintroduction Path – which establishes the concept that knowledge is a reconstruction / translation of an individual immersed in a certain culture and a given time. This principle is based on three aspects: the combination of the opposites (Dialogical), the solidarization of dichotomized knowledge and the conscious subject that is an epistemological subject, an active, reflecting individual, who acts over knowledge. Also because this individual is not locked in a place and, mostly, because he/she can foster a sense of responsibility and citizenship, leading to solidarity among people.

In Education, the concept of Complexity refers to the need of focusing not only in the contents of a discipline, but also to the considerations of their context as a whole (including cultural and social conditions), as well as their life cycles (birth, issue, aging, adapter transformation and transdisciplinarity). (Morin, 2003).

The adoption of these paradigms tend to promote a healthy educational process since "(...) every person, every organization, every animal, garden, tree and forest is a complex system (...)" (Meadows, 2008, p. 102-106). Not taking this into consideration means running the risk of analyzing and acting only partially in relation to facts, through myopic and biased analysis criteria.

### 3. ReSa: SOCIAL NETWORK FOR COLLABORATIVE LEARNING

ReSa - Rede de Saberes Coletivos (Collective Knowledge Network ) is a Brazilian project consisting of a conceptual learning environment for decentralized, interactive and collaborative learning proposed by Uebe Mansur (2011a). In his work, the author converged the notion of Complexity (MORIN, 2006) with Social Networks, using the Elgg framework in its digital structuration.

The main stimulus for the development of this environment is given by the possibility of promoting a complex environment, in the context of academic graduation, involving, mainly, Supervised Internship as presented by Uebe Mansur (2011a).

As stated by Uebe Mansur (2011b) and Klering et al. (2011) traditionally adopted nvironments such as Moodle, ROODA, Teleduc etc. have a centralized, deterministic, and reductionist conception, since the interpersonal interaction is usually focused on the pace and attention of a tutor (structure One for All - Point to All - P2A). Moreover, they often act as mere repositories of activities and lesson files – a transcript of the traditional classroom plus some multimidiality. In a comparsion, while these traditional learning environments have student interaction tools, tnetwork environments are themselves the tools for social interaction.

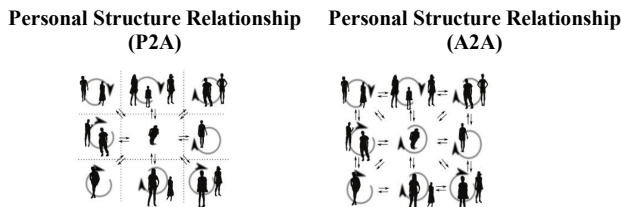


Figure 1 – Patterns of Personal Structure Relationship between people

The following picture shows the ReSa welcome page:



Figure 2 – ReSa Welcome Page

It is important to highlight that the latest version of ReSa can be accessed in both Brazilian Portuguese and English. The Elgg framework allows for the creation of a community containing a group of users with the same interest. The community can be opened or closed, in which case, the user needs previous authorization by the owner of the group.

Other interesting aspects are some Elgg tools that allow for interaction between users, as listed bellow. It must be stressed that these tools are independent and available for community or personal use, depending on the member's interest:

- *Wall* – Allows access to general discussions between members. There is a personal wall and a wall for each Community. In the Wall it is possible to post a short message to be viewed by all group members.
- *Info* – Allows access to personal or community metadata. Inside the group Info there is a link that allows the user to send personal and simultaneous messages to all group members, differently from the Wall that does not send a personal warning of arrived messages.
- *Blog* – Allows users to create personal or group Weblogs.
- *File* – Allows file upload in diferent formats (PDF, ODF etc), and configures access level for files. It can be done individually or by a group.
- *Bookmark* – Allows the creation of shortcuts for quick access to interesting pages.
- *Activities* (only for groups) – Shows the latest activities carried out in a community.
- *Discussion Group* (only for groups) – Allows the user to create specific posts with a theme to start a discussion among group members. Some applets available in Elgg also allow to embed YouTube, Vimeo and other video sites, as well as presentations upload in sites such as Slideshare.

- *Pages* – Allows the creation of personal or group pages. It is not a Blog, but a site with pages and linked subpages. It depends on level access to be used by people outside a group created in ReSa.
- *Wire Posts* (only for individual users) – Allows quick access to posts made by the users themselves or friends, members of the community in general.
- *Photo* – Allows the upload of photographs and configures access level for it. It is also allows the creation of photo albums with the automatic presentation feature.
- *Friends* (only for person) – Allows the user to list and access personal interactions such as personal messages.
- *Invite Friends* (only for individual users) – Allows the user to invite friends outside Elgg.
- *Friend of* (only for individual users) – Allows the user to find out who added him/her as friend.

The screenshot in Figure 3 shows a list of the personal features described above:



Figure 3 – ReSa Member Menu

Figure 4 shows the Community (Group) features:



Figure 4 – ReSa Group Menu

#### 4. METHODOLOGY

ReSa in itself is only a Digital Social Network environment. What enabled a unique way for academic learning for Supervised Internship was the methodological proposition made on the doctoral research, and presented in this paper.

As explained by Uebe Mansur (2011b), in researches on Complexity, it is not possible to trace a straightforward way and objective to be followed without facing deviations. This is why the methodological process is very empirical in these cases.

This research was based on references found in the Experiential Development Methodology proposed by Moraes and La Torre (2006). This is a specific methodological approach for researches on Complexity. According to the authors, this field of study requires some aspects for research validation:

- Identified evidences;
- Utility of the Knowledge generated;
- Possibility of applying the knowledge generated in other contexts;
- Confirmability of the registred process;
- Procedures made under ethical methods.

Work with research methodology on Complexity demands that the researcher takes into consideration that there is not only one way to do it, as it is not a static process. Everything in research on Complexity is under movement, and in constant change. time.

It must be emphasized that, initially, the supervised internship adopted by the Management undergraduation course (the field study of this research) was the same adopted in other undergraduation courses. In this traditional approach, students have theory and practice without digital support. As discussed by Uebe Mansur (2011a), this traditional methodology does not promote a mechanism that facilitates the student's desire for interactions that are necessary to characterize a learning environment designed under Complexity principles.

The undergraduation course observed for this study use a methodology based in the Cartesian Model that results in a final report. The Supervised Intership report aims at promoting a formal student reflection on the connections between academic theory and practices established during the experience. This report presents the following parts:

- *Part 1 - Introduction:* in which the objective and methodology are described.
- *Part 2 - Presentation of the Internship student:* with a brief history of the student's academic and professional background.
- *Part 3 - Presentation of the Company:* with a presentation of the company and the sector in which the training was developed.
- *Part 4 - Activities performed in the Internship:* With discrimination of 10 activities performed during the internship.
- *Part 5 - Relationship between Internship activities and the theory seen in the undergraduation disciplines:* Consisting of a table lwith the 10 activities described in Part 4, as well as a ratio of two classroom and subjects related at the activity.



- *Part 6 - Description of the internship and how it is related to undergraduation disciplines:* Which describes how each activity was developed in the internship, and how each subject helped the performance of that activity.
- *Part 7 - Conclusion:* In this final section, students must include: an analisis of the possibility of linking classroom theory to internship activities; indication of of the most important classes for his/her personal academic development; and suggestions for improvement of the undergraduation course.

In the original methodology (without student participation), students had to develop five tasks as described:

*Task 1* - A brief description for each of the followig part of the Internship Report:

- *Internship Final Report Part 2* - Personal presentation (highlightening academic and professional data).
- *Internship Final Report Part 3* - Company presentation (highlightening the link between student and company).
- *Internship Final Report Part 4* - Description of 10 activities performed during the internship.

*Task 2* – Task 1 develops from Part 4 of the Internship Report. Students report on how each activity was developed in the internship. This task, along with Task 4, makes up Part 6 of the Internship Final Report.

*Task 3* – Resulting from Task 2, students organize a table containing 10 activities performed during the internship. For each, they establish a ratio of two classes and subjects related at the activity. This task makes up Part 5 of the Internship Final Report

*Task 4* - This task, along with Task 2, makes up Part 6 of Report. Starting with the table developed in Task 3, students must describe how each activity was developed in the internship, and how each subject helped the performance of that activity.

*Task 5* - For this task students must finish the internship report adding Part 1 (Introduction) and Part 7 (Conclusion) to the other sections previously developed. This stage includes the addition of all the other elements of the report, such as cover, contents page etc.

Task 5 is developed according to the student's rhythm, but other tasks follow the rhythm, monitoring and guidance of the Academic Internship Supervisor. Usually, Tasks 1-4 are developed by students in four meetings with his/her Supervisor. At each meeting, students must present the evolution of tasks or develop/present them in the classroom, or solve their questions.

At each task deadline, the next task is explained, in class, by the academic internship supervisor. All tasks follow similar development procedures.

The final stage follows the 4th deadline. This includes the production of the final report on the first four tasks. At end of the experience, a final version of the report is produced with addition of pictures and illustrations of the student's internship.

Figure 5 illustrates this process:

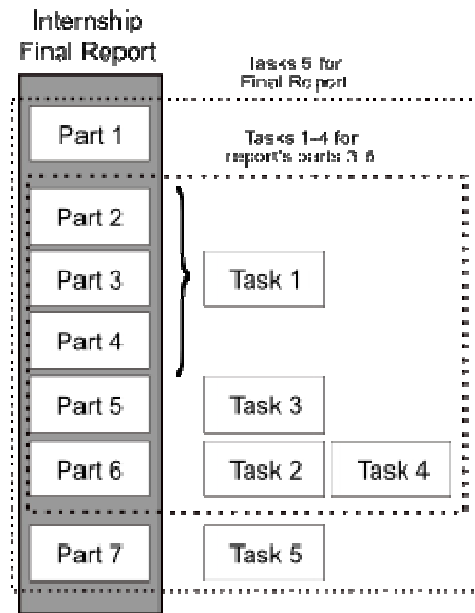


Figure 5 – Internship Final Report process development

By using ReSa, it was possible to try to switch the described process to a digital environment, enabling the addition of a new element to the four-task process, and the development of Parts 3 to 6 of the Final Report.

This new element consisted of a new stage which did not exist in the original process. It requires students to post 40% of his/her internship activities in ReSa (4 of 10 activities of Task 1).

The students' first activity in the network was individual registration and creating of communities (groups). Settings and configurations had to be made in order to improve the network. This first contact with ReSa did not provide major findings besides the fact that the tool is functional. However, the mere fact of being logged in did not motivate students to interact spontaneously.

Once the technological basis for the research was established, it was possible to envision a laboratory experiment representing a wide range of experimentation through actions focused on interpersonal relationships. At this stage, it was possible to make the first trial of interactions with the Internship students in ReSa. Thus, the Internship supervisor created and posted tasks for students enrolled in Supervised Internship I (7<sup>th</sup> semester) and other two theoretical subjects: Fundamentals of Management and Career Management. Students in Supervised Internship II (last semester of the student's academic life) was not involved at this initial stage.

This offer of subjects opened to students enrolled in Supervised Internship I, Fundamentals of Management, and Career Management, resulted from a concern that this first experiment could unpredictably affect the result of the educational activities of students enrolled in Supervised Internship II. Thus, it was decided to make interactions more experimental in disciplines that were not so "tied" to the formal educational outcome required in the Internship Final Report.

## 5. RESULTS

As students of Supervised Internship I were newcomers in the Academic Internship, the purpose of the experience was to allow them to have some contact with the ReSa environment and, at the same time, to promote their first contact with the Internship Report. Therefore, students were assigned to develop Tasks 3 and 4, related to Parts 5 and 6 of the Internship Report. The choice for these last tasks was due to the fact that when ReSa was open for use, Tasks 1 and 2 had been completed by students.

At this initial stage, the innovation of the project, compared with the original methodology, was a Discussion Topic, created after Task 3, aiming at promoting interaction between students. This was an opportunity for students to access their classmates' answers – a new element introduced into the original methodology.

Regarding the discipline Fundamentals of Management, activities were offered with the purpose of promoting integration and allowing students to become familiar with the virtual academic environment.

- *Talk about yourself* – “Introduce yourself and say why you decided to take the Management course.”
- *Meet classmates* - “Select three messages posted by your classmates, read their posts, and ask questions related to their professional or academic activities. Try to identify their characteristics and interests.”
- *Meet veterans* – “Visit the activity in Supervised Internship I for graduating students. Study the activities they have developed, and check if they are, in their opinion, related to the Administrator. Review your expectations on the Director's position based on the activities posted by your peers.

Another objective was to study the origins and theories of Management Science in order to verify the possibility of A2A interactions (Figure 1) in the social network. Thus, some tasks were assigned, triggering interactions between participants. In one of the tasks, students were asked to give their opinion about their using ReSa, and to make suggestions for the next tasks. It is important to emphasize that these tasks did not have any goals other than the student's awareness of the results given by their use of the environment.

For the subject Career Management, aimed at discussing professional aspects of the area, the tasks were meant to bring up the Paths of Complexity. As explained previously, the tasks tried to promote interaction between students, and make them more comfortable when using the digital environment:

*Task 1 – Understanding Complexity* – “Make an internet research and post your thoughts on Complexity.”

*Task 2 – Systemic Path* – “Read the posts made by your peers, and help them complete what they said with your opinion on Complexity. Write as if you were talking to them face to face.”

At this stage, the idea was to begin a dialogue – an embryo for collaborative learning through a glance outside yourself, a glance of the others.

In the following activities, students were asked to change their academic behavior so that they would stop being problem solvers and start proposing problem situations.

*Task IV - Propose a problem situation* – “Relate a practice of Management in the academic or business areas that requires a management decision making. It can be a professional situation which you have experienced or a fictional one. Recreate this situation, and present it as a case where your peers will have to make a decision and justify it.”

At the end of both subjects, students were suggested to give their first impression in using ReSa, and its application in the study of Management Theory .

This experiment was very important for the “internalization by doing” stage, as it allowed the perception of the possibilities of using the social network in future researches on Supervised Internship Methodology.

Regarding the theoretical aspect of the study, it was possible to verify that the environment promoted a Dialogical Path as Systemic Path from the time the students needed to read and give opinion about colleague posts. Original names were replaced by numerical designations:

*Student 1* – “Hello \*Student 2\*! Why have you decided to study Management?”

*Student 3* – “Good evening \*Student 4\*! What is your job at your Company? Do you like it?”

*Student 2* – “In fact, I would try to study Civil Engineering, but I was influenced by my father. He had worked for more than 20 years in the building business. Almost a year and a half ago he opened a building materials shop. So I decided to study Business Management to help him manage the business and expand our shop.”

The environment had good acceptance by the group, despite some discomfort experienced by new students in Fundamentals of Management regarding the new methodology. Most of them had never considered the possibility of using social networks with the purpose of academic interaction and learning.

This discomfort is explained by students as a result of the fact that some tasks took place almost entirely in a digital environment:

*Student 4* - “Pedagogically, I found it very interesting (...) we could be searching the web while questions or comments came up in the “forums”, and also use the computer and the internet as learning resources. What I missed in the discipline was the contact / interaction in the classroom, because I still think that using the internet and computers can bring people together, but it STILL keeps people a little distant from each other. (...)”

*Student 3* - “I found it a very interesting experience, mainly because of the interaction with other students. (...). The tool should be a complement, which, along with lessons, will make our studies more rich and interesting. ”

However, for other students, this physical “distance” also meant an approximation:

*Student 5* - “The social network is a great tool. With it we can integrate and find out what our classmates think about certain topics, which we don't usually know; it is very good to have this virtual integration, [...], and thus be in touch even when we are not at school, it brings us together.

After this period of experimentation, it was possible to demonstrate that ReSa was functional as an Academic Learning Environment.

## 6. CONCLUSIONS

Discussion in this paper results from initial findings of a research presented by Uebe Mansur (2011a, p.91-91), which indicates that the mere transference of tradicional academic procedures of supervised internship to a social network learning environment is not enough to promote interaction and systemic view between students and other Paths of Complexity as expected.

Uebe Mansur (2011a, p. 92) explained that expectations (perhaps naive) were that, once framed and populated with a community of internship students, use of the social network environment would be natural and broad for the establishment of links between people, as well as institutions, but the only objective result was a student's paper written to solve the demands aimed by the internship supervisor.

Due to this finding, it was necessary to promote a discussion group made up by the researcher, the internship supervisor and some internship students about the next methodological steps regarding demands from the supervisor to achieve the goals of his research.

The next challenge would be the attempt to promote these characteristics through practices that allowed the conversion of the learning environment and the view of the actors (students and teachers) about the learning process.

In regards to the network environment, an analysis of its structure allowed for the perception that the organization of the loci of interaction was made under Cartesian assumptions; in other words, independent Observatories (Communities) referring to areas of knowledge (Supervised Internship, Theories of Business Management, Professional Development etc.), and that, despite promoting integration and some characteristics of Complexity for its members, it did not promote interaction between the communities.

It was also possible to observe how strong Cartesian Thinking is once it impregnated and shaped the initial methodological procedures: the organization of communities in ReSa was a transcription of the organization traditionally adopted in which knowledge was structured in isolated disciplines representing areas permeated by an inaccurate discourse of multi, inter, and transdisciplinary knowledge.

The result of this structural model ends up being the formation of nuclear structures, clusters, which have a satisfactory interaction, but weak correlation between its members. In traditional academic design, one can see this model in classes and disciplines in which students develop satisfactory interactions in the peer group, but unsatisfactory ones with peers in other groups.

Regarding academic practices, the study found that, despite the use of the Network, the teacher / student relationship in the learning context was still very vertical and downward, since the dynamics of the network activities consisted primarily of posts made by students following directions of the faculty. The activities came to promote greater interaction and systemic view among members of an Observatory (community), but this interaction happened only because teachers requested it.

With rare exceptions, some students had their own initiatives and extrapolated the boundaries of the Observatory, as shown in the following post:

*Student 6:* "I would like to know from each one of you if, on the day of Prof. Andre's exam (July 1), it would be possible

to change the scheduled time, 7:50 pm to 7:00 pm (of the same day) (...) The reason for this request is that I was asked to be best man in a wedding that starts at 8:30 pm and if the exam is at the usual time, I can not attend the wedding. In view of all the expenses I had to make and the impossibility of finding another best man.

I know this is a personal matter, but to change anything it is necessary that everyone agrees. I ask those who agree with the idea to post their consent (...)"

*Student 2* - "Fine with me. => "

*Student 1:* "ok"

*Student 5:* "All right."

Student interactions between communities of different subjects did not happen either. In other words, interactions remained nuclear, without establishing a systemic interaction in the environment as a whole.

This experimentation stage comprised the empirical use of a social network as an internship learning environment characterized by the transfer, with minor modifications, of a tradicional internship academic methodology to ReSa. Ther author conclude that the social network is only a tool when its implementation is made without an academic methodology specifically developed for the purpose. Another conclusion is that, in fact, the learning environment did not show the characteristics of a complex environment as reported by Uebe Mansur (2012).

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