

# Project Oriented Immersion Learning "Building online digital products for a cyberspace publishing house"

Icaza, J. I.; Heredia, Y.; Borch, Ole

*Publication date:*
2004

*Document Version*
Også kaldet Forlagets PDF

# Project Oriented Immersion Learning

"Building online digital products for a cyberspace publishing house"

## POL
## A project oriented learning experiment

by

**Jose I. Icaza, Yolanda Heredia and Ole E. M. Borch**

Tecnológico de Monterrey, México and Aalborg University, Denmark

| | |
|---|---|
| **Tecnológico de Monterrey**<br>**Mexico** | **Aalborg University**<br>**Denmark** |

## Abstract

*In project oriented learning, project proposals are derived from realistic problem situations; student teams work on the project from day 1 of classes, and the project chosen drives contents, theories and methods required to finish the product that solves the problem. Students become responsible of learning whatever they need to finish their project, while professors become facilitators of learning and team work.*

*This report describes the process and results of an online graduate course that combined the POL methodology combined with the learning by immersion method. Students assumed a trimester-long role-playing exercise, where they became Authors contracted by a fictitious cyberspace publishing house in order to produce several digital products, including e-books, tutorials, web site designs and others, all related to the Learning Organization area. They were responsible for defining what problem was solved by their product; actually choosing the kind of product and its contents; researching needed material; and building the product following a strict project methodology that emphasized documentation and included individual, team and plenary reflections on learning and process.*

*While this great amount of freedom and the unusualness of the publishing house web site-course created some episodes of uncertainty and anguish, these were mostly overcome as time passed and all 11 student teams finished worthwhile products while developing social, project management and metacognitive abilities. The course design and the research were done in the context of a collaborative agreement between Tecnológico de Monterrey in Mexico and Aalborg University in Denmark. Both Mexican and Danish students participated, although most of the later dropped out due to cultural and technological problems discussed in the report.*

*An important outcome from this experiment is that the methods used for the POL process are to be recommended for open minded professors who can adapt to the facilitator role.*

Table of contents

# 1. Introduction

Distance education is increasingly necessary in the modern world, as it has become the best alternative for adult students that may thus combine their need for continuous education with family and work responsibilities.

Universities that offer distance education programs are constantly worried about offering virtual environments increasingly effective in achieving significant learning, as well as being innovative in the user interface and achieving an adequate presentation according to the type of students targeted.

Thus there is a need to create learning environments that incorporate modern learning methodologies that use information technology in the best possible way, and to research the results that such environments achieve in the students.

This report describes an environment based on the Project Oriented Learning (POL) methodology combined with the Learning by immersion methodology. We describe the results of a graduate online course that uses these techniques and formulate some recommendations.

This report is organized as follows:

In section 2 we present the background of the research, based on a collaborative agreement between Aalborg University in Denmark (AAU) and Tecnológico de Monterrey in Mexico (Tec). After the research objectives in section 3 and an explanation of POL in section 4, the research methodology is presented in section 5. In section 6 and 7 the actual experiment with results are described. Chapter 9 covers the conclusions followed by section 10 and 11 with recommendations and further research. Chapter 12 proposes future collaborative plans for the two universities in the POL area. Acknowledgments and bibliography are in section 13 and 14 respectively. Appendixes contain mostly links to a large number of documents created during the experiment and thus too big to be printed. Instead hyperlinks are given.

***Note: This report contains links to the actual course involved in the research, including personal data of the students. To protect their privacy, please consult the authors before making any use of these data***

# 2. Background

The present study is a collaborative effort between two institutions: Aalborg University (**AAU**) in Denmark and Tecnológico de Monterrey (**Tec**) in México.

The relationship between the universities began when Tec decided to find out about novel learning strategies with the leaders of constructivist education in 2000. AAU is a leader in Project Oriented Problem Based Learning (POPBL), which in this report we will simply call POL (Project Oriented Learning). AAU has been recognized internationally and has performed comparative studies between their students and the students of more traditional Universities.

Tec's effort to learn from the leaders was divided into three stages:

1. The Universities signed a general agreement to collaborate. (2000- 2001) and agreed to develop further plans.
2. The leading university (AAU) designed a program to train Tec professors in the learning strategy. Many professors took the courses at AAU during summer time, and then completed the training at Tec together with other activities in order to incorporate the learning strategy to their courses.(2001-2002)
3. An agreement was signed to conduct research in these areas and in more specific projects. (2003- 2004) (Ref. 13: Martin 2002)

For the present study, AAU was interested in investigating how to manage the POL methodology in online learning environments. For this purpose, AAU contacted the Virtual University which is a part of Tec. The Virtual University is a leader in distance education in Mexico and Latin America. It has 14 years of experience in conducting distance education supported by satellite and information technology. A specific graduate course was selected for the research; this course utilizes the learning by immersion strategy (Ref. 5: Icaza, 1997 Ref. 6: Icaza, 2004) besides POL. On its part, Tec was interested in evaluating the results of incorporating most of the POL methodology as practiced in AAU, but in online environments using IT to support the process. In particular, the authors were interested in assessing the development of social, cognitive and project work abilities in the students.

# 3. Research objectives

The present research addresses the following objectives:

1. To create a learning online environment that adopts the POL methodology following as closely as possible the AAU approach.
2. To describe the process of adaptation of professors and students to this environment that combined the use of IT, the POL methodology an the Learning by Immersion approach
3. To identify learning results including the development of abilities in the students.
4. To bring up recommendations for new experiments as well as transfer guidelines.

# 4. POL methodology

The POL methodology leads students to build their own learning based on the planning and development of a series of project activities which result is a *product.* The project – the tool for learning – is developed in several phases and each of them is assigned an appropriate time frame. During the project the students must plan the process, take decisions, decide the content of the product, organize their time and resources, and finally produce the product. Then they must present it to the professors and defend it. To get to the goal the students are supported by constant facilitation from the professors and are assigned a team environment for project documentation, including process and product. The environment also fosters reflection and collaboration and holds the final implemented product.

The POL methodology implies several elements:

- The students learn to solve problems that lead to products, applying any knowledge they deem important for the project's success.
- The core of the method is to explore needs, possibilities, solutions, choices and work on practical problems with no easy solutions.
- The problems incorporate at least one course but it is better when it includes the content of several disciplines.
- The project requires that student uses the knowledge that he/she has acquired in the semester or in past semesters.
- Allow and encourage student's freedom to create innovative solutions.

## 4.1. Description of POL and why POL.

Here we will describe POL within the general context of POL: Problem Based Learning (PBL). PBL has many implementations in educational systems depending of culture, tradition and background. A single course ending up with a problem based exercise is one simple example of a PBL; another is a study circle solving a problem.

A more advanced example is when students organize in project groups working the major part of the semester solving real life problems, and supported by relevant courses. This method is recognized as a very effective method of learning.

The essential shift is by changing the focus from teaching to learning.

To emphasize team-organized project **o**riented **p**roblem **b**ased **l**earning in an international environment, the POPBL or just POL was used in this research. The major activity is the project and courses are taken to support the project work. The courses are developed to support the learning process and should not be developed and presented in a traditional teaching way.

Instead of joining a teaching lesson, the materials are developed to support and stimulate individual learning and especially team oriented learning. The learning process is supported by reflections both by the individuals and inside the team.

POL has turned out to increase the learning depth, stimulate motivation and as a very important feature to enhance collaboration and study progress, which are important factors for students in distance education.

To conclude: Approaching POL needs a shift to project work and to utilize a new learning methodology.

*"In the university, learning is a goal and the problem is a tool. Students develop project skills. In the industry, these skills are the tool, and the product is the goal" (*Ref. 3*:* Fink, 2002)

## 4.2. POL at AAU

POL is used in all academic programs at Aalborg. Each semester (half calendar year, full time) This amounts to 900 hours of work load for a student, equivalent to 30 ECTS (European Credit Transfer and Accumulation System). Each semester has a theme which defines the overall context for all projects during the semester. Projects are typically offered by academic staff as a motivating description of problems to be solved by the project group.

Groups of 4-6 persons are formed by the students themselves, and they are offered a group room and a facilitator. The project takes approximately 15-20 ECTS of the working load and the supporting courses (P-courses) take around 5 ECTS; the rest – about 5 ECTS of the time is spent on courses (S-courses) related to general knowledge such as math and physics.

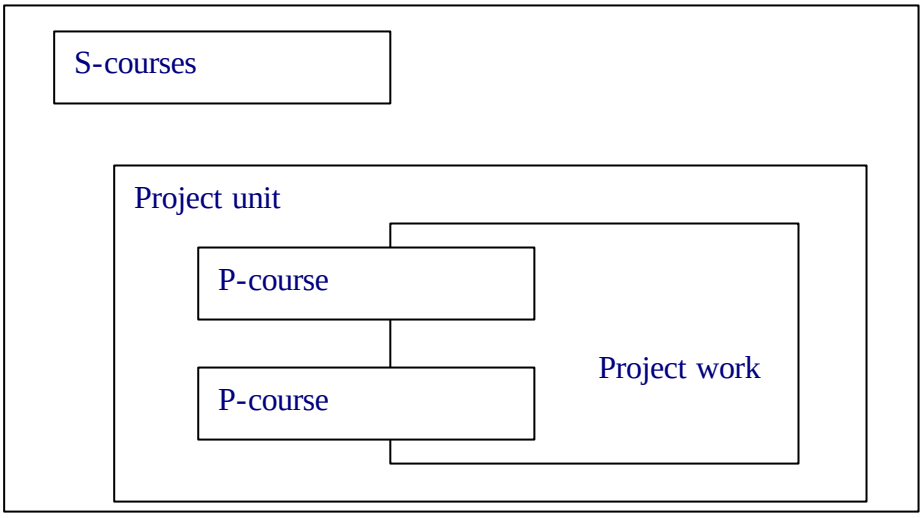


**Figure 1 One full time semester activities. P-courses (sometimes called PSC – Project Support Courses) primarily support the project work. A project unit is the collection of all project activities. S-courses are sometimes called NPSC – Non-Project Support Courses)**

The P-courses are taken on-campus following a fixed schedule or on-line before a fixed date to ensure parallel competence development so that all members of the project group are able to collaborate on an equal basis.

The project work is started by investigating the environment and context relevant for the project (pre-analysis) in order to develop a problem description. After agreed delimitations the project description is defined and goals and sub-goals for the project are described. Sub-goals are used to distribute work among sub-groups within the project group leaving the hard work to the sub-groups and overall information flow and decisions to group plenum meetings. The project proceeds through phases of analysis, design and implementation. A "milestone activity" at the end of each phase has students reflect as a team on the process and results of the phase and make plans for the next one. Facilitator and group members must ensure that all members are working with equal complexities in theories, methods and implementation. Problem solving in P-courses is related to topics in the project or at least in the theme and is performed in the group room.

At the end of the semester, a written project report is defended by the group in an examination session. The facilitator and an external examiner also question the individual group members in used theory and methods ending up with an individual grade. The general POPBL methodology as implemented in AAU (AAU) can be consulted in (Ref. 1: Kjærsdam, 1994).

Mapping AAU on-campus education as described to off-campus and distance education turned out to be difficult, but a method has been found and tested (Ref. 2: Knudsen, 2004). The major difficulties are to establish a virtual group room and to ensure progress in individual competence development. Careful planning in terms of distribution of work and timing is essential and milestones are very important for taking status, corrections and planning the next working phase. The on-line collaboration uses audio chat and written

documents anchored on a digital platform suitable for remote POPBL education ex. UniFlex from AAU (Ref. 19: Borch, 2003).

The role for the facilitator is not to solve problems in the project, but to guide and inspire students through essential theories and problems. This is performed in written and oral discussions about strategy and corrections of working documents. Planning by using a time schedule on which everybody has agreed upon is very important. A dangerous role distribution in the project group is if one person is taken the leadership and responsibilities all the time. In real life, one project leader is needed, but in the educational environment everybody must try to be responsible for example of one of the phases of the project. In the team work, responsibilities are distributed to all members being token holders for specified documents, report chapters or project phases.

Another role is the coach; which is not a dominant leader, but a manager of decisions and a time table manager and observer. Especially in case of on-line education this role is very important not only for progress in collaborative work, but also to tighten the group members socially together.

The facilitator must not act as a leader in the project group trying to intervene in its internal affairs. It is easy for the facilitator to dominate an on-line meeting. Here it is important for the facilitator just to listen, give short answers, recommend and point out possibilities to be investigated.

Employers from industry have many times stated that students from universities using POPBL have advantages. Many reasons are given of which 3 are mentioned here:

- Great skills in collaborative working – planning, organization, timing etc.
- Open minded and critical in the problem definition phase to study and evaluate areas relevant for the project.
- Cross disciplinary abilities

Personally, the students also feel responsible for contributing to the group work. In reality students not doing so, are excluded from the group, which occurs rarely since the groups are established after discussions among students based on social matters and scientific interests. Such a commitment for contribution from the individual student is also an indirect push to study and increase competences on time; otherwise scientific discussions in the project group can not be performed on an equal level.

## 4.3. POL at Tec.

Constructivist learning strategies such as POL have suffered some changes when adapting them to the particular circumstances of Tec from the standard methods used at other places. With regards to POL, the authors of this document list in the following table the main differences between AAU's POL and Tec's POL before this research was started.

| Aspect | AAU | Tec |
|---|---|---|
| Curriculum | - Uses this technique trough the whole academic program. POPBL is institutionalized. | - Uses technique in individual courses. The professor decides whether he wants to use POL or some other methodology. |

| | | |
|---|---|---|
| Functions of professor | - A mixture of course-conducting, problem-solving facilitator and project work facilitator | - Face to face: Professor teaches and facilitates project work. Online: a tutor also helps with facilitation. |
| Project phases | - Project proposal, pre-analysis, analysis, design and implementation. A great emphasis on Process, learning and reflection. | - Project proposal, development and implementation. Emphasis on product and little attention to reflective practices. |
| Student assessment | - An oral and written final assessment, both individual and team assessments.<br>- Project process and product are the focus of the assessment.<br>- Essential parts of P-courses are incorporated in the assessment also.<br>- S-courses have their own exam. | - The Project is part of the final assessment, which includes also other elements including for instance essays, developing conceptual maps, participating in discussion forums and so on. |

**Table 1 – Differences in the implementation of POL at AAU and Tec**

# 5. Research Methodology

This is a qualitative study (Ref. 14: Bodgan, 1982) because the researchers wanted to observe and describe: a) the adaptation of the students and professor to a virtual learning environment that includes AAU-Tec POL methodology, communication technological tools and immersion learning, b) the learning results and the student's abilities development. To analyze the data, the researchers inductively try to give meaning to the perspectives of the students and professor, doing content analysis of the research data.

## 5.1. Student demographics

This course was taken by 51 Mexican students and 11 Danish students. Background of these students was very diverse. Most Mexican students took this course as part of their Management of Information Technology (35) or Masters in telecommunication (11). Four students were taking their MBA degree. Work experience was very diverse –23 students had between 1 and 6 years; 14 students had between 7 and 10 years of experience, and 10 had more than 10 years. 3 students did not report their experience. Danish students, on the other hand, were bachelor students in the Spanish Literature program of AAU with little IT experience. Further comments on the Danish students experience appear in section 0 of this report.

## 5.2. Student teams

As mentioned previously, 11 student-author teams of 5 people each were formed by the professors who tried to ensure diversity in team roles, geographic location and experience; in particular, one Danish student was assigned to each team. A team-role questionnaire was used to find out about the team member roles most adequate for each student: (Ref. 17: Team role link)

Of these 11 teams, teams 1, 6 and 8 were selected for the detailed analysis that appears in section 0 of the report.

## 5.3. Instruments and observation process

Instruments: all the formats that were used to get information about the variables and research outcomes that we wanted to describe. Many of these formats were part of the guidelines and policies of the course.

- Documentation of project phases
- The team´s portals where they kept project process documentation and results.
- Students' profiles
- Individual reflection logs ( 'blog's)
- Milestone activity team reflections
- Plenary reflections
- Final team assessments by Messenger chat

Observation: Variables that will be observed through the instruments and team products.

- Social and communication skills
  - Dialogic communication and uses of communication technology among members of each team. (Section 7.5)
  - Leadership patterns (Section 7.6)
- Process skills
  - Project portal design (Section 7.2)
  - Characteristics and evolution of the product (Section 7.3, )
  - Development process and its documentation (Section 7.4)
  - Degree of concordance between plans and results (Section 7.8)
- Reflection skills
  - Depth and content of reflections. Content of individual 'blog's. (Section 7.9)
  - Student comments in Team and plenary reflections. (Section 7.10, 7.11)
  - Final student reflections, feelings and learning's during the final team assessment. (Section 7.7)
- Strategies followed by professors to facilitate project work (Section 7.12)

The actual data observed is referred to in the appendixes.

## 5.4. Research procedure

1. Planning of the course, taking as background the previous course designs (Ref. 16: Icaza, 2001) , the indications of the colleagues of AAU on the elements of the POL methodology; the assessment scheme that had to be integrated into the course; and the needed technological tools. (April - June 2003)

2. Design and construction of the learning environment: Program of the course, design of the Madison organization, design of the Web pages, communication tools. (June - August of 2003).
3. Implementation of the 11-week course (URL: http://www.ruv.itesm.mx/cursos/maestria/mati/sep03/si271/) distributed by the Virtual University. (September to December of 2003).
4. Analysis of the data and elaboration of this research report. Once the course concluded, we analyzed the information that was generated during the course (Appendix H). The analysis consisted of a comparison among three of the 11 teams on the items of observation listed above, creating categories of analysis and reaching conclusions. Also, the researchers did a content analysis of the individual reflection blogs. The report was elaborated in a collaborative way between the Mexican and Danish researchers. (January to April of 2004).

# 6. Description of the POL course in this research.

The course selected for this research was "Technology and Culture in the Learning Organization" (SI271), a graduate course in the masters in Information Technology Management online program of the Virtual University. This course had been given on other occasions using project methods that did not strictly follow Project Oriented Learning rules, but that did feature the learning by immersion method (Ref. 5: Icaza, 1997).

For the implementation of the course addressed in this research, it was used a POL methodology closely based on AAU's version of POPBL; therefore, there was a greater attention on Process and Reflections under the motto for the students: "A high-quality, continuously improving process leads to a high quality product".

## 6.1. Learning by immersion at Madison Webley Cyberpublishing Corp.

In this virtual POL methodology, the students find themselves immersed in a fictitious organization simulated on web pages; they are assigned work roles in this organization, and learn while they work (learning by doing), as it happens in real-life organizations. For this course, the students work in Madison Webley, a publishing house in the year 2010 (six years after the course date). The "course pages" become the intranet of Madison. The students were told on the first day that they had been invited to work in Author teams of this organization, in order to conceive, plan and develop one of Madison's digital products. Documentation of the product-producing process as well as the evolving and final product was to be held in web pages that the students could modify; this was facilitated by the use of a powerful tool, Twiki (Ref. 7: Twiki link), described later.

## 6.2. Madison's structure

Figure 2 shows Madison's home page
(http://www.ruv.itesm.mx/cursos/maestria/mati/sep03/si271 )


**Figure 2 Madison's home page.**

Briefly, the first menu item "Empresa" (Enterprise) includes the organization's mission, values and main editorial policies. Here the students learn that Madison produces all sorts of digital products such as books, tutorials, online courses, web sites and so on, and that products are developed by teams of authors distributed over Cyberspace. These products are divided into several Thematic Divisions, and authors are to produce works related to the Organizational Learning (OL) Division. In this same menu item they also find submenu "product catalog" which links towards digital products previously published by Madison (in previous versions of the course), submenu "current projects" which links to current project portals and another submenu linking to a description of the project methodology used to develop digital products. Menu item "Human capital" points to Author profiles, student's individual reflection logs or web-log's (from here on called 'blogs') and a document with author and editor role descriptions. "Resources" links to Madison's library, editing help files and so on. Finally "Forums" leads to several asynchronous dialog forums.

## 6.3. Author Teams

The student-authors are assigned to project teams. Each team develops a digital product chosen within very general policies provided in the OL thematic division description –these policies are similar to guidelines typically found on "Book series" schema commonly found in paper-based books and state the general objectives of books within the series. Following the recommendations of the POL methodology, students were free to choose any kind of product and content for the product consistent with the thematic division's guidelines. Students were asked to fill up a Team Role questionnaire (Appendix C), and then the teams were formed by the professors who tried to ensure a diversity of roles within each team, as well as diversity in geographic location, gender and experience.

## 6.4. The POL methodology as adapted to Madison

The standard AAU's methodology for POPBL projects (section 4.2) was introduced to the students as the standard process followed by Madison to develop its products. In the context of Madison digital products project, in the pre-analysis phase the students decide on what kind of product and content they wish to work on within the guidelines of the OL thematic division; in Analysis they figure out the work that has to be done and divide it up into several parts, for example agreeing on a table of contents if they decide on an e-book digital product. Also, they gather any bibliography they may need to develop their product. In Design they agree on issues of representation of the digital product and begin to actually produce each part, which they finally finish up and integrate during the Implementation phase. All this process must be carefully documented. Each team must plan its activities and divide up the work to be done in the most adequate way. They must also evaluate their final product against their own initial intentions and plans, and validate it externally with the intended audience.

Before starting the project work, there is a "Phase zero" where the students get familiarized with the Madison organization, the technology used to support project work, the project methodology, their role as authors and the role to be played by facilitator-editors. In this phase they also practice with the Twiki technology and form the Author teams.

At this point, the reader might be wondering where and how the students learn the "required course material". As mentioned in section 4.2, at AAU students take several "P-courses" concurrent with their project, and they must apply what they learn in these courses to the project. For this Madison experience, the most essential part of the course material was given to the students as support material associated with the Thematic Division, as project phases evolved. For instance during the pre-analysis phase, the students read a document that contained the minimum information about Organizational Learning that they needed in order to decide which product they wanted to build; in Analysis, some essential readings in OL were given that they would most likely need to know regardless of the product chosen; and so on.

Of course, depending on the product that they had decided to build, the students had to research additional material either in Madison's library or elsewhere. Given the wide diversity of the projects, professor-selected material amounted to approximately 25% of the total material learned by each team of students.

→ *In the POL methodology, the chosen project drives the contents, theories and methods required, not vice versa.*

## 6.5. Technology –Twiki, hypernews and Microsoft's messenger

Three IT tools were used to support the project work. The hypernews (Ref. 4: Hypernews link) tool is a typical threaded discussion forum manager. Microsoft's messenger is a popular tool for synchronous chat. These tools are not further described here as we assume the reader is familiar with their characteristics.

The Twiki tool is in the category of "wiki servers", a very different kind of tool that supports collaborative writing of hyperlinked text, web page editing and asynchronous dialog –all this implemented in the context of a very simple and powerful idea, the "wiki page".

A wiki page is a normal-looking web page with an Edit button attached; the page resides in a central wiki server. Any authorized person watching the page can go ahead and change it directly on the browser's interface, and from that moment other people anywhere else would see the updated page. No other editor is needed, and no html knowledge is needed either since wiki implements some simple text conventions to do typical html things such as incorporating images, displaying bullet lists or bold text and so on. One of the conventions produces a new wiki page linked to the current one without having to know anything about URL's or about the server's directory structure. In the case of the Twiki tool, Twiki keeps track of page versions and of who did what changes to each Twiki page. In short, Twiki enables the users to produce complete interlinked web sites very simply, and further enables groups of people to change the sites asynchronously without interfering with each other. There is a short flash tutorial of Twiki in Appendix F.

A wiki page does not have a single author such as it happens with messages in a forum; rather, a group of people co-author the page. Any member of the group can modify other member's texts.

This concept of "wiki servers" has been used previously in education (Ref. 8); inside organizations it is commonly used to hold user-updatable intranets (Ref. 9). There is even a complete free encyclopedia, the Wikipedia (Ref. 10: Wikipedia link), where the users authorized to read, add or change any encyclopedia article include all 'cybernauts', such as you, the reader of this paper.

For Madison, each project team was given a space in Twiki to hold the project portal, project process documentation and the evolving and final project result –the digital product. Most teams also used "Twiki talk pages" –simple web pages that store dated messages from team members. Further, each author had a Twiki page to hold a personal reflection blog and each team held their team reflections in their Twiki space too. Plenary reflections were held in hypernews forums.

Each team was free to set up their project portal and to use the three communication tools or other tools in any way they wanted. So communication among members of each team (discussions and decisions concerning team activities such as problem solving, project topics and process management) was performed using either twiki talk pages, hypernews forums, or chats; in the last two cases, teams were required to set up links in their portal to their hyperenews messages or to uploaded logs of the chats. This is further commented later on in this report

## 6.6. Student reflections

Besides the usual POL team reflections at the end of each project phase ("Milestone activity", see section 4.2), we also introduced two other levels of reflections: personal and plenary. Some general guidelines (Appendix D) were given for these reflections.

**Individual reflections**. The students were required to actualize a dated personal reflection 'blog' at least weekly. Each student had a twiki page to store his or her reflection blog.

**Team reflections** ("Milestone activity") were performed at the end of each project phase. Students were required to reflect on their learning and team performance and to make plans

to improve team coordination. As well, in this activity they evaluate progress so far, assign a token-holder and other responsibilities for the next phase and make detailed time plans.

**Plenary reflections** occurred twice during the term in Hypernews forums. They contain discussions common to all participants ex. about support material for the project and general matters of the POL, the Madison organization and so on.

**Meta reflections** were informally held in the Cafeteria (another hypernews forum) and contain all other discussions like the teacher's behavior and the bad weather or football.

# 7. Results – teams 1, 6 and 8

During the course the researchers decided to select three teams (1, 6 and 8) to analyze the information that was gathered by the various instruments. This was not a random sample; the researchers selected those teams that would give more research data, following the recommendations of qualitative methodologies. This section describes results for the three teams selected; general comments for other teams appear on section 8.

## 7.1. Team demographics

Table 2 lists general demographic characteristics of the students belonging to the teams selected for analysis, including gender, age, nationality, experience and so on.

| | **Team 1<br>K-Team** | **Team 6<br>Twiki Wonders** | **Team 8<br>Twiki Knowledge** |
|---|---|---|---|
| Gender | 3 male men<br>2 female women | 3 male<br>2 female | 2 male<br>3 female |
| Average age | 37 years | 32 years | 29 years |
| Nationality | 100% Mexicans | 70% Mexicans,<br>20% Danish<br>10% Venezuelan | 80% Mexicans,<br>20% Danish |
| Average number of courses taken | 7 courses | 10 courses | 8 courses |
| Bachelor Program | 90% System Engineer | 80% Ingenieros en computación,<br>20% Ing. En Comunicaciones | 50% Ing en sistemas computacionales<br>25% Ing electric<br>25% Ing. En comunicaciones |
| Master Program | 100% Master in administration of technology | 80% Master in administration of technology<br>10% Master in Information Technology<br>10% of International Studies | 90% Master in administration of technology<br>10% Master in Information Technology |
| Mean number of years of professional experience | 12 years | 16 years | 8 years |
| Login schedule | After 18.00 hrs | After 18.00 hrs | After 18.00 hrs |

| | | | |
|---|---|---|---|
| Place of login | 100% Office/House | 100% Office/House | 100% Office/House |
| Roles in the team (see Appendix C for role descriptions). Each student might have more than one preferred role | Sculptor 2 times<br>Curator one time<br>Scientific 2 times<br>Coach 5 times | Scientific 1 time<br>Coach 3 times<br>Curator 1 team<br>Explorer 1 team | Crusader 1 time<br>Coach 2 time<br>Curator 1 time<br>Sculptor 1 time |

**Table 2 Demographic data about teams 1, 6 and 8.**

As we can see in Table 2, all the "Authors" are adult part-time students who have work and family responsibilities. The best way for them to study is by distance education. Almost all of them are engineers in systems and communication. They have taken more than the half of their master's degree. They have been part of virtual teams. In the case of the Danish students, they are young girls, without much experience in distance education. They write perfect Spanish. Only one of the Danish girls finished the course.

## 7.2. Team portals

Once the students familiarized themselves with the Madison organization and the Twiki technology, the first task that each team had to do, was to design a project portal in any way they wanted. They had to decide the team's name and the organization of the information in the portal including for instance their dialog pages, time planning and so on. All the teams received the same general information about project requirements; yet, each decided to organize their portal space in a different way. Table 3 depicts the way that teams organized their Twiki space. Appendix H includes a link to the actual project portals

| **Team 1**<br>**K-Team** | **Team 6**<br>**Twiki Wonders** | **Team 8**<br>**Twiki Knowledge** |
|---|---|---|
| The portal was divided into several sections:<br>a) Project data,<br>b) Teams´s members,<br>c) Team´s 'blog',<br>d) Work plan by phases,<br>e) Final product,<br>f) Quality criteria.<br><br>Each phase contained the following data:<br>a) Content,<br>b) Talk section<br>c) Milestone<br>d) Milestone's talk<br><br>At the end of the portal there are 7 seven documents that are attached to the portal. | The portal was divided into several sections: The first section contained the following information:<br><br>a) Project data,<br>b) Members,<br>c) Discussion area,<br>d) Support material,<br>e) Announcements<br>f) Portal information<br>g) Final Product.<br><br>In a second section they had the documentation of the project development:<br><br>a) Pre analysis<br>b) Analysis, | The portal was divided into sections:<br>a) Work table<br>b) Team 'blog's<br>c) Work Plan<br>d) Messages from the Editors<br>e) Individual 'blog's<br><br>In a second part they put the documentation for the phases of the project:<br>a) Introduction and Pre analysis<br>b) Analysis<br>c) Report of the process<br>d) Site map<br>e) Final Product |

| | | |
|---|---|---|
| | c) Design,<br>d) Implementation,<br>e) Integrated report.<br><br>Each of these phases of the process had a work plan, a report of the phase, a link to a hypernews dialog page, and the milestone activity. | |

**Table 3 Team's portals**

The portal was a useful tool for the teams to organize the job; it is the virtual environment of the team to communicate, to keep project documents, to receive the facilitator's comments, to write and keep 'blog's, and so on. The portals reflect the creativity of the members to decorate their environment.

## 7.3. Description of the Products

| | **Team 1**<br>**K-Team** | **Team 6**<br>**Twiki Wonders** | **Team 8**<br>Twiki Knowledge |
|---|---|---|---|
| Product's name | Knowledge mapping: an useful tool in a learning organization | Practical guide to manage the change process in a LO. | Collaborative model for Mexico's development: a knowledge management approach |
| Type of product | e-book | Web site | Interactive e book |
| Product description | An e-book for electronic consultation about the different ways of mapping organizational knowledge and its applications in a LO. | The web site is a practical guide to manage the change process since the manager and facilitator point of view. | Proposal of a collaborative model to create a LO-like effort among government, universities and organizations in countries like Mexico |

**Table 4 Description of the product**

The teams decided: a) the kind of e- product, b) the specific content of the product, always related to the LO area. Each team found a different way to build the product according to its interests.

## 7.4. Phases of the Process

In the Pre-Analysis phase, teams decided the kind of product they wanted to develop and the general thematic or contents of the product. Table 5 shows the general characteristics of the product. Again, there were significant differences among the three teams.

| Phase 1<br>Pre-analysis | |
|---|---|
| **Team 1<br>K-Team** | - The work began with a calendar that shows the deadlines for each activity, the person on charge of each activity and a description of the activity.<br>- Then there is another section in the portal used to documents discussion about the project. They called this section: "Analysis", "Talk section".<br>- The final document for this phase of the project included the following points: Problem definition, opportunities related to the project, type of product, audience analysis, the way to solve the problems that are related to the project, justification of the solution proposed, advantages of the proposed solution |
| **Team 6<br>Twiki<br>Wonders** | - This phase began with a calendar; it shows the deadlines for each activity, the person on charge of each activity, a description of the activity.<br>- In a second link the team discuses about the points of the project (Problem definition, opportunities related with the project, type of product, audience analysis, the way to solve the problems that are related with the project, justification of the solution proposed, vantages of the proposed solution)<br>- A link for the dialog in hypernews. This team decided to use hypernews for asynchronous communication.<br>- A link for the milestone activity |
| **Team 8<br>Twiki<br>Knowledge** | - This team started its phase with a section for introducing the members of the team.<br>- Then there is a section called "Brain storm"; inside of it, they wrote all the ideas about the product. (Problem definition, opportunities related with the project, type of product, audience analysis, the way to solve the problems that are related with the project, justification of the solution proposed, advantages of the proposed solution)<br>- Then there is a link for the final document of the phase.<br>- They also have a link for bibliography and material than can support the phase.<br>- And milestone section |

| Phase 2<br>Analysis | |
|---|---|
| **Team 1<br>K-Team** | - This team writes, in the first place, the strategies that they consider very important in the reflections of the previous milestone.<br>- Then a calendar shows the deadlines and responsibilities for everybody in the team.<br>- They use the same table to develop the main points of the phase. "Analysis", "Talk section" and "Milestone"<br>- The team creates a link to store bibliographic resources. In the talk section everybody writes down his opinion or shows his point of view. The team developed the following points: Product structure, a table of contents, functional specs for the interface of the electronic product. |
| **Team 6<br>Twiki<br>Wonders** | - The team uses the same phase structure:<br>a) Working plan,<br>b) Documentation for the process and results of the phase<br>c) Dialog link<br>d) Milestone.<br>- This team put the bibliography inside of the documentation section.. |

| | |
|---|---|
| | - The team developed the following points: Product structure, a table of content, the interface of the electronic product. |
| **Team 8 Twiki Knowledge** | - This phase is divided into the following sections:<br>a) Analysis<br>b) Brain storm<br>c) Table of contents<br>d) Milestone<br>- The team uses images to enhance the outlook of the product and the points that they must develop.<br>- Product structure, a table of content, the interface of the electronic product |

| **Phase 3 Design** | |
|---|---|
| **Team 1 K-Team** | - This phase began with the calendar in which everybody in the team has his/her own link to a twiki talk page. The talk pages are Twiki pages in which each member writes down his opinions and results, organized by date.<br>- In these pages the team creates and develops the different files that will be part of the e-book.<br>- The team discussed a dynamic architecture of the e-book and a static architecture |
| **Team 6 Twiki Wonders** | - The team uses the same phase structure:<br>a) Working plan,<br>b) Document of the phase,<br>c) Dialog link<br>d) Milestone.<br>- Documents of the section shows the static and dynamic architecture of the web site a style manual to adapt all the documents to it.<br>- The team developed the following points: Product structure, a table of content, the interface of the electronic product. |
| **Team 8 Twiki Knowledge** | - For this phase there are just two sections<br>a) Design document<br>b) Milestone<br>- In the design document the team described two architectures. They describe the content and draw a figure of the interface of the interactive e book |

| **Phase 4 Implementation** | |
|---|---|
| **Team 1 K-Team** | - This phase began with the calendar in which everybody in the team has his/her own link to a Twiki talk page.<br>- In the talk pages there is a dialog about the last phase of the project. (Implementation, external validation, internal validation, a questionnaire for the users). There is a definitive document in word. |
| **Team 6 Twiki Wonders** | - The team uses the same phase structure:<br>a) Working plan,<br>b) Document of the phase,<br>c) Dialog link<br>d) Milestone.<br>- The working plan contains a calendar; it shows the activities and the responsibilities of each of the members.<br>- The document phase contains one by one the web pages that will be part of |

| | |
|---|---|
| | final Product.<br>- The dialog links to the hypernews forum, in this forum author's converse about the implementation of the product and the way of evaluate it.<br>- Milestone: this team has made all the reflections in an individual way. |
| **Team 8 Twiki Knowledge** | - The team organized the space in:<br>a) Process Report<br>b) Milestone<br>c) Verification and validation of the product<br>- The process report is organized as a table. The table shows the process that the team followed to create the product, in this case an interactive book. They use a question-answer technique to describe the process.<br>- The milestone was written using a third person writing style.<br>- The last part shows a text in which the team compares the initial objectives with the final product. |

**Table 5 Phases of the project**

*Comments* Table 5 shows the way in which the teams organized their own portal and the steps they followed to create the product. In general terms the structure of the portals is similar, perhaps because recommendations of the editors helped them to organize their spaces. Each team began every phase with a calendar that makes clear and visible the activities for all the members, the dead lines and the responsibilities. The second part of the portals represents in slightly different ways the processes that the teams used to communicate and to take decisions. As teams, they were free to choose the way and the tools they used to communicate among members. Teams developed their own communication style:

## 7.5. Communication style

| | **Team 1 K-Team** | **Team 6 Twiki Wonders** | **Team 8 Twiki Knowledge** |
|---|---|---|---|
| Language behavior | - This team used the language in a very friendly style.<br>- They call themselves by his/her first name.<br>- The number of participations of the team is moderate. They have long participations with a lot of material included specially in Twiki pages. | - This team used a more formal language. They call themselves by their first names. They are friendly but more formal.<br>- The number of participations in the team space is intense. | - This team used a lot of images to help them to organize the material.<br>- They used a friendly style to call themselves. |
| Means of communication | - The team uses the messenger chat as the principal mean to communicate, especially when they needed to take | - The team uses only the hypernews tool.<br>- All the dialog links in all the phases of the project were in hypernews. They | - They use the chat to take decisions. They put a log of the chat dialog in the portal. |

| | | | |
|---|---|---|---|
| | decisions about the work.<br>- The team writes in Twiki the final text and it contains all the changes and modifications of the text. | used Twiki to upload final documents of each phase. | - They used Twiki talk pages to communicate also. |
| Kinds of interactions among team members | - The members of the team interact in the following way.<br>a) Giving an idea<br>b) Completing the ideas of others<br>c) Getting information<br>d) Writing texts to build some parts of each document<br>e) Asking – answering<br>f) Making nice comments to other team mates.<br>g) Make severe comments of the work of all the team.<br>h) Share bibliographic material | - The members of the team interact in the following way.<br>a) Giving an idea<br>b) Completing the ideas<br>c) Getting information<br>d) Writing texts to build some parts<br>e) Asking – answering<br>f) Make nice comments to other team mate.<br>g) Make severe comments of the work of all the team.<br>h) Share bibliographic material | - The members of the team interact in the following way.<br>a) Giving an idea<br>b) Completing the ideas<br>c) Getting information<br>d) Writing texts to build some parts<br>e) Asking – answering<br>f) Make nice comments to other mate.<br>g) Make severe comments of the work of all the team.<br>h) Share bibliographic material |

**Table 6 Communication style**

Table 6 shows that teams used a very colloquial language to communicate, slightly more formal in the case of team 6; they call themselves by their first names but that didn't imply that every member worked as hard on the project. They used several of the communication tools that were provided. All of the teams used varied interaction strategies and they used the abilities of the members to create text, images, gifs and html language to make the products.

## 7.6. Leadership Role

| | **Team 1<br>K-Team** | **Team 6<br>Twiki Wonders** | **Team 8<br>Twiki Knowledge** |
|---|---|---|---|
| The leader role | - In this team there were two female | - In this team one male member leads | - In this team there were two female |

| | | | |
|---|---|---|---|
| | members. They had the most intensive participation (quantitative and qualitative).<br>- The male members worked hard too but they have less interaction in the Twiki pages. | the team. He has the most intensive participation in the hypernews dialog.<br>- The rest of the members have also a lot of participation; nevertheless, the self-appointed team leader guides the action. | members. They conducted the team, and the participation was very well organized. |

**Table 7 Leader role**

The students were asked to rotate team leadership for each project phase; the leader was called "token holder" ("estafetero", in Spanish). The instruction was not followed in an exact way because there were members that by personal characteristics conducted the team more easily than others members. We observed that the leadership was sweet and natural; there were few conflicts about it.

## 7.7. Project defense

In the last week of classes, the project facilitators conducted written chats with each team for the first and only time in the course. Previously, all the interaction between facilitators and teams had been asynchronous, mainly using Twiki talk pages.

Table 8 contains observations made by the facilitators based on raw chat materials, available upon request. from the authors of this report

| **Team 1 K-Team** |
|---|
| - Each of the members answered the questions that the professor asked about the way to do their project, the use of mental maps, and the description of each of them.<br>- They related the way that they followed to work on the contents and the design of the e book; they finally worked on parallel in the two aspects.<br>- The team used a static and dynamic architecture for the project.<br>- The professor conducted the team to make a reflection about the process of learning.<br>- Do they prefer to learn following strict guidelines or to themselves guide the process?<br>- The team felt that during the process they were alone and needed more guidance, but they also think that they learned a lot by themselves.<br>- The virtual environment that represents a real enterprise, the orientation of the editors but a lack of concrete answers helped them to "survive" and learn more than in a traditional course. The team felt uncomfortable at the beginning but as the project progressed and was more consolidated, they felt better.<br>- The team reflected that in real life you always receive an incentive in money form or in some other way. So you always try to get the incentive and try to be independent of the guidance of others. They reflected on the difference between the Western people versus Oriental in the sense that Western people usually ask for something in exchange, whereas the Oriental ones instead make offers of what they know or have. Finally they recognized that they were inside a certain learning paradigm when taking any course. This paradigm was very different. |

- Each of the members answered the questions that the professor asked about the way to do their project, the use of mental maps, and the description of each of them.
- They related the way that they followed to work on the contents and the design of the e book; they finally worked on parallel in the two aspects.
- The team used a static and dynamic architecture for the project.
- The professor conducted the team to make a reflection about the process of learning.
- Do they prefer to learn following strict guidelines or to themselves guide the process?
- The team felt that during the process they were alone and needed more guidance, but they also think that they learned a lot by themselves.
- The virtual environment that represents a real enterprise, the orientation of the editors but a lack of concrete answers helped them to "survive" and learn more than in a traditional course. The team felt uncomfortable at the beginning but as the project progressed and was more consolidated, they felt better.
- The team reflected that in real life you always receive an incentive in money form or in some other way. So you always try to get the incentive and try to be independent of the guidance of others. They reflected on the difference between the Western people versus Oriental in the sense that Western people usually ask for something in exchange, whereas the Oriental ones instead make offers of what they know or have. Finally they recognized that they were inside a certain learning paradigm when taking any course. This paradigm was very different.

**Team 6 Twiki Wonders**

- This team began to reflect about the amount of "stress" that can be positive or negative in real life; people is in constant change, adapting to a constantly evolving environment. In this sense, the course represented a part of real life. The students commented that for different topics, they prefer a different way to learn; for example, to learn new software they prefer that someone teaches them, but for topics that are well organized they prefer to learn by themselves. The team recognized the positive effects that the blog's and team reflections had on the process and products.
- The team identified the process with the portal and the product with the web site. They recognized that the project gave them the opportunity to improve the job of others; they felt the interdependence among the members in the process. At the beginning, there was a different level of compromise among the team's members, but compromise level increased during the process. They described that this was one of their best virtual experiences because their communication increased over time, because they worked together at a distance, because they used various tools that made an efficient environment to work.
- They suggested being very careful to bring feedback; they suggested to be more direct at the beginning and little by little "leave the team alone". The team reflected about the "independence" and the need to "receive approval comments", and on the level of compromise of all the members to fulfill the goals on time. They told that in real life, the boss controls the "results" no the activities of the people. They reflect about "Who has the control?" If it is inside or outside of the team, especially in situations like this where they decide on the time, deadlines, activities, etc. And then they fail to accomplish the task
- This team began to reflect about the amount of "stress" that can be positive or negative in real life; people is in constant change, adapting to a constantly evolving environment. In this sense, the course represented a part of real life. The students commented that for different topics, they prefer a different way to learn; for example, to learn new software they prefer that someone teaches them, but for topics that are well organized they prefer to learn by themselves. The team recognized the effect that the blok's and team reflections had on the process and products.

- The team identified the process with the portal and the product with the web site. They recognized that the project gave them the opportunity to improve the job of others; they felt the interdependence among the members in the process. At the beginning, there was a different level of compromise among the team's members, but compromise level increased during the process. They described that this one of the best virtual experiences because their communication increased over time, because they worked together at a distance, because they used various tools that made an efficient environment to work.
- They suggested being very careful to bring feedback; they suggested to be more direct at the beginning and little by little "leave the team alone". The team reflected about the "independence" and the need to "receive approval comments", and on the level of compromise of all the members to fulfill the goals on time. They told that in real life, the boss controls the "results" no the activities of the people. They reflect about "Who has the control?" If it is inside or outside of the team, especially in situations like this where they decide on the time, deadlines, activities, etc. And then they fail to accomplish the task.

**Team 8 Twiki Knowledge**

- The team said that this was their best experience in a virtual team, because of the virtual environment and the compromise of all the members.
- They commented that the process followed some phases: formation of the team, a idea-storm time, stabilizing and a real union between the members.
- They had a lot of communication.
- They felt that they became a high performance team.
- They asked for more chats with the tutor to get more feedback. They recognized that they wanted more feedback because in the traditional learning methodology professors always gave them a clear orientation.
- But in this case they decide all the time, the activities, the deadline, etc and they did a excellent job in terms of content, design, bibliography, portal, etc.
- They said: If the instructors had given them a list of questions or suggestions they would have followed them, and they would have had less freedom to create their product.
- They recognized that they invested more than 12 hours per week. They created the portal, looked for bibliography, read it, then organized all the material, and the programmed the interactive e book. They felt anxious during some phases because they expected strict comments from the facilitator. They encountered a lot of similarities with real life. When they ask for a "good salary" then they compare their job with other teams.
- They developed a lot of skills in the course and about the POL methodology and the virtual environment; the tools promote this learning. They felt that they also developed valuable attitudes during the process. They enjoyed the course and would repeat this experience.
- The team said that this was their best experience in a virtual team, because of the virtual environment and the compromise of all the members.
- They commented that the process followed some phases: formation of the team, a idea-storm time, stabilizing and a real union between the members.
- They had a lot of communication.
- They felt that they became a high performance team.
- They asked for more chats with the tutor to get more feedback. They recognized that they wanted more feedback because in the traditional learning methodology professors always gave them a clear orientation.
- But in this case they decide all the time, the activities, the deadline, etc and they did a excellent job in terms of content, design, bibliography, portal, etc.
- They said: If the instructors had given them a list of questions or suggestions they would have followed them, and they would have had less freedom to create their product.

| |
|---|
| - They recognized that they invested more than 12 hours per week. They created the portal, looked for bibliography, read it, then organized all the material, and then programmed the interactive e book. They felt anxious during some phases because they expected strict comments from the facilitator. They encountered a lot of similarities with real life. When they ask for a "good salary" then they compare their job with other teams.<br>- They developed a lot of skills in the course and about the POL methodology and the virtual environment; the tools promote this learning. They felt that they also developed valuable attitudes during the process. They enjoyed the course and would repeat this experience. |

**Table 8 Synchronous written project defense for 3 teams**

The synchronous written defense of the project shows that the Tec students wanted to receive more strict guidance; they expected specific comments from facilitators about what to do and how, so these students during all the process felt more anxious, uncomfortable almost in the first part of the course. Little by little, they recognized that they were looking for bibliographic materials, reading and learning about Learning Organization, they had to build a product so many of them had to deal with technological tools such as flash animations to create the web pages and find the way to make an interactive product. So they found that the team members must to be very responsible and that the job of all the members was necessary for the success of the team as the tension began to be heavier.

## 7.8. Concordance between plans and results

| | **Team 1<br>K-Team** | **Team 6<br>Twiki Wonders** | **Team 8<br>Twiki Knowledge** |
|---|---|---|---|
| Plans | - The team planed an e-book that contains the way to make maps of knowledge in organizations | - The team planned to make a practical guide to manage change in Learning Organizations. | - The team planned an interactive e book that contains a development model for developing countries like Mexico, based on learning organization and knowledge management theories |
| Results | - The team creates an electronic book with all the process of mapping knowledge. (See link 1 ) | - They produce the guide and within it create an animation that reflects all the information about the resistance to change and how to manage it. (See link 2) | - The team creates a illustrated e book with information, analysis and model. (See link 3) |

**Table 9 The Concordance between plans and results**

- Link 1: http://copernico.mty.itesm.mx/TWIKI/pub/Mwp01/FaseCuatroE01Talk/ElMapeodeconocimientook.exe
- Link2: Guia en Linea para el Manejo de Cambio en una OA

- Link3:
  http://www.prodigyweb.net.mx/yolandagzz/

## 7.9. Analysis of individual reflection 'blog's

The researchers made a content analysis of the individual reflection 'blog's, to find out about what the students were mainly reflecting about, and how deep or meaningful their reflections were. This analysis was carried out for teams 1,4,6,8 and 10.

For the analysis, each entry in the reflection log was split into several parts, where each part could be codified as a unit; sometimes this was a single phrase, other times two or three phrases or a paragraph. A single part (*reflection unit*) could have several codes assigned to it, although this was not frequent. For each reflection unit, the following codes were assigned regarding the content of the reflection and the level of reflection:

### 7.9.1. Reflection content

A cursory review of the students' reflections revealed that they mainly talked about some common themes in their reflections. From these themes, the following content codes were assigned in order to classify reflection units:

1. The team – student reflected about team events, their team mates and so on
2. Self-reflection – Student said something about himself or herself
3. Learning – Student said something about what he is learning
4. Project – Reflections about the Project in general
5. Methodology – Reflections about Project methodology
6. Tools – The technological tools
7. Course, or Madison – The course and the course pages; the Madison enterprise
8. Bibliography – Bibliography or course contents
9. Reflection about facilitation
10. Suggestions

### 7.9.2. Depth of reflection

The following codes, taken from (Ref. 18: Kitchin, 2001), were used to assess the depth of reflection

a. Description – Description of facts, events and process
b. Critical thinking – Analysis, synthesis and generalization of information from a number of different sources
c. Personal exploration – Exploration and evaluation of own feelings and attitudes
d. Making connections – Evaluation of various learning experiences and the extent of making connections between theoretical and practical issues
e. Cyclical reflection – Extent of reflection on the process of learning that has occurred

These are the results on reflection content. The table indicates the number of reflection units that different teams produced for each of the content codes:

| Content Code | | Teams 1,4,6,8,10 | Team 1 | Team 6 | Team 8 |
|---|---|---|---|---|---|
| 1 | The team | 214 | 47 | 31 | 46 |
| 2 | Self-reflection | 193 | 36 | 42 | 50 |
| 3 | Learning | 80 | 36 | 6 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| 4 | Project | 167 | 29 | 25 | 28 |
| 5 | Methodology | 16 | 4 | 1 | 3 |
| 6 | Tool | 57 | 14 | 4 | 4 |
| 7 | Course, Madison | 51 | 2 | 4 | 19 |
| 8 | Bibliography | 41 | 14 | 2 | 9 |
| 9 | Facilitation | 50 | 17 | 1 | 18 |
| 10 | Suggestions | 10 | 2 | 3 | 1 |

**Table 10 Reflection contents – number of reflection units per content code**

| **Reflection depth code** | | **Teams 1,4,6,8,10** | **Team 1** | **Team 6** | **Team 8** |
|---|---|---|---|---|---|
| **a** | Descriptive | 739 | 179 | 94 | 142 |
| **b** | Critical thinking | 127 | 17 | 25 | 37 |
| **c** | Personal exploration | 8 | 3 | 0 | 4 |
| **d** | Making connections | 5 | 2 | 0 | 0 |
| **e** | Cyclical reflection | 1 | 0 | 0 | 1 |

**Table 11 Reflection Level – number of reflection units per reflection depth code**

Reflection quality and extent varied widely among students. Some of them wrote quite extensive and deep reflections, whereas others barely described their activities with practically no reflection on these activities.

These tables show the average way in which students used the reflection blogs. Reflection is one way to get awareness about the personal and team learning process. In this experience the students reflected about many topics and the depth of their reflection was more oriented towards description.

We do not have a reference to compare the number of "critical thinking" reflections against data for other courses nor for the same students before taking these courses. Nevertheless, given that these students were not used to write down personal reflections, the researchers feel that the number of "critical thinking" episodes was adequate for the audience of the course. On the other hand, the tables show that there was not a strong evidence that the students had a personal exploration about the way that they usually learn.

## 7.10. Analysis of first plenary reflection

The first plenary session took place by the middle of the term. All the students participated in an asynchronous hypernews forum. The discussion space was divided into sections headed by a specific question from the professor, plus one section for "any other comments". Table 12 shows the structure of the forum and some of the most relevant comments.

| | **Number of participations** | **Relevant comments** |
|---|---|---|
| Approach to the course | 37 | - Traditional versus Immersion course,<br>- Ambivalent feelings.<br>- Individual versus group compromise<br>- Previous experience versus new learning effort |

| | | |
|---|---|---|
| POL methodology | 26 | - Emphasis on collaborative and responsibilities within teams.<br>- Asked for a more precise schedule from the professors |
| Your actions | 30 | - Students made a self apprisal about giving their best effort, but felt the need for more guidance.<br>- They observed an improvement along time.<br>- They are learning to be more proactive. |
| Twiki tool | 32 | - The general opinion is that Twiki is a useful communication tool and that it supports well the collaborative effort.<br>- They invested time to know it but it was not a waste of time |
| Interchange of ideas and experiences | 20 | - They suggested that each team should schedule a chat every week, because the chat session allows them to take decisions very quickly.<br>- Each team had their own best practices for successful chats. |
| Criticisms and suggestions | 12 | - They asked for closer guidance.<br>- More support material.<br>- More specific feedback about the project. |

**Table 12 Analysis of First plenary Session reflection**

## 7.11. Second plenary session

The second plenary was conducted a few weeks before the end of the course. The students were distributed into two groups, so as to let everybody have more time and space to participate. In both subgroups the questions were the same.

| Forum part: | Number of participations | Relevant comments |
|---|---|---|
| Phase 0 | 20 | - They suggested to put more initial tips for the next time the course is given<br>- More tutorials<br>- They had difficulty to find some items. Improve information distribution and navigation in the web pages.<br>- Students should be open-minded to accept new educational paradigms. |
| Pre analysis | 14 | - The most difficult part was to integrate the team<br>- In other courses they are used to have the teams do very specific tasks but in this course they had a lot of independence. |
| Analysis | 15 | - They asked for more support material, like in others courses.<br>- They didn't had a clear idea about the theme they had chosen, so they found the relevant bibliography slowly |

| | | |
|---|---|---|
| | | - Different levels of compromise between members of the team. |
| Design | 15 | - This was the more creative phase but it demanded a lot of time to find material, to synthesize it, to create and program the electronic product.<br>- They learned by doing |
| Implementation | 13 | - Generally speaking the teams were integrated very well.<br>- They can improve details of the product when implementing it. |
| Work strategies | 16 | - Compromise and control<br>- Technology supported the process |
| Madison course platform | 15 | - A nice learning experience<br>- Develop more abilities<br>- Some students prefer other electronic platforms and more structured courses |

**Table 13 Second plenary session**

## 7.12. Process facilitation

The virtual environment of the course allows the members of the teams and the facilitator to have a permanent and asynchronous space of work.

As far as the functions of the facilitators of the course they were:

- The titular professor of the course designed the main part of the Madison environment, selected content and was the person in charge of the course.
- The tutorial professors who were in charge of the facilitation of the project work throughout course.

The facilitation of the process mainly consisted of intervening with four types of comments:

a) Reminders on procedures and phase deadlines by means of public notifications to all the teams that appeared on the main Madison page and to each individual team.
b) Positive comments on the performance of students
c) Directions towards places to obtain bibliography and other resources.
d) Questions to the students in order to have them reflect on aspects of their process and product

# 8. Results – other teams

In general, all 11 teams finished on time good quality products. For the other teams, these products were:

| Team name | Name of the product | Type of product |
|---|---|---|
| 2. Global KM Team | Methods and strategies to Learn to Learn by the e – learning model | E -Course |
| 3. Alliance | Change in the enterprise | Electronic journal |

| | | |
|---|---|---|
| 4. Madweb | The informative portal to acquire knowledge about the Learning organizations | Portal |
| 5. Twiki revolution | Integral knowledge management | Web page |
| 7. Sinap twiki | Digital Interactive Manual of line reference | Information storage |
| 9. Knowledge Business | Manual to learn a methodology to mange the changes in a TI industry | E- Manual |
| 10. Knowledge Bytes | Web knowledge distributed by internet 2 for the collaborative learning | e- book |
| 11. Twiki GAJES 11 | The way of the learning person | On –line course |
| 12. AutoDigit_ | New learning tools for ISO 9000 | On –line course |

The students of the course developed a great variety of skills (social, communication, to manage a project, reflection, etc) and create a diverse kind of products. The researchers think that when the professor follows the students, they have the freedom to create and to take of their abilities.

# 9. Cultural aspects

– A testimony in four parts from Danish participants

## 9.1. Part 1: Expectations

The students involved were: Sylvester F. Andersen, Marianne Nielsen, Anja Christensen, Sarah-Birgitte Nielsen, Heidi Cruse, Louise Hegelund Waaben and Camilla Solberg.

All of the Danish students had great expectations of virtual cooperation together with the Mexican students. On the Spanish International Studies (SIS) education, the bachelor of the Danes, they worked with culture and international communication and all of the Danish students had studied Mexican history. All of the Danish students had been studying in a Spanish spoken country, so they felt that they did have something in common with the Mexican students, and they were really looking forward to the virtual cooperation on the internet.

## 9.2. Part 2: The process

We had some introductory mails from *Ole Borch*, *DK* and from *José*, *MX*, with basic introduction about the cooperation. We were told to visit the website and register as new students. Already this early in the process some students had certain problems. We all think that the web pages were blurred and confusing. We did not really know "what to do or where to go" on the page. When we received a detailed mail from *José* with a guideline that explained step by step what to do, the different links were not working. This caused some misunderstandings and a few Danish students decided to end the cooperation, because the beginning was confusing.

### 9.2.1. Structure

The Danish students agree that the construction of the course structure is not very good for international use. We all think the site is confusing with too much text, and it is unclear where to go. The Mexican students may have a different opinion, but it is important to remember that they do study technology and we study language. They were all older than us and were already working in the trade of technology. They did definitely have a better knowledge to technology than us. We needed some basic instructions to navigate a system like Twiki.

Many of the Danish students that did not continue the cooperation tell that they used too much time surfing around on the web pages without knowing what to do. And that is the reason why many students dropped out of the cooperation. They felt they spend too much time.

### 9.2.2. Instructions

Those students that continued the cooperation found the project very attention-grabbing, but all the students agree that they needed more basic instructions. Nobody really knew what to do on what time. It takes long time to find out the structure on the web pages. When we joined the different groups we felt that the Mexican students almost gave up about the fact that we were a part of the team as well, because we were too slow and our qualifications were below the Mexicans.

### 9.2.3. Barrier of language

None of the Danish students found language as a problem. Most of the Danes agreed that it takes more time to read literature in Spanish than in Danish, but all the Danes agreed that the main problem in the cooperation was the shortage of instructions.

### 9.2.4. What did we learn in Denmark?

The Danish student that finished the teamwork says that she did learn a lot during the cooperation. She did not know anything about the subject before, but learned more and more during the process. She learned most of the cooperation itself. She tells:

*"The communication in the group was really perfect. The Mexican students were very kind to help me in every situation. I chatted with the Mexicans on Messenger and they told me exactly what to do. They helped me out of all the problems I had with Twiki.*

The Danish student had never earlier worked in a group having a coach, but in this cooperation there was a boy having the job as the coach of the team. He was responsible that we followed the study plan. The Danish student says:

*"In a team of six students it is definitely a good idea to have a coach. Not that this person dominate or takes more solutions, but he has the general idea of how we get to the goal. It is a first-class idea. This is absolutely some positive I have learned by the cooperation and some thing I will use in the future."*

## 9.3. Part 3: Collaboration

### 9.3.1. Skills with teamwork

Before we entered the cooperation, we thought that we had to teach the Mexicans about team work, because AAU is well-known for high-quality skills of team working. But the Mexicans were already superior team workers, so we were quite even in those skills.

### 9.3.2. Skills with IT

The difference in our skills with technology was reasonably big. The Danish student's are studying language and culture on a traditional university. They do use the internet to search literature, but the Mexicans were directly study technology on a virtual university, so there was a enormous difference in our skills of technology.

### 9.3.3. Work ethic

If there did ever exist a stereotypic conception of Mexicans called "mañana-mañana culture" it does not longer exist in our minds. The Mexican students were really energetic. It was a bit surprising for the Danish students that have studied in Latin America earlier. They had a work ethics higher than we had seen hardly ever.

### 9.3.4. Responsibility

As mentioned, the Mexican students were very serious about the project. We think they really wanted us to be a part of the team, but if we did not keep the agreements made in the group, they could not be hold responsible for our absence. It was distinctly that the Mexican students worked intentionally, while the Danish students joined the cooperation voluntarily.

## 9.4. Part 4: At the end

It seems that the major problem was the Danish students did not have sufficient experience in virtual communication. The Danish students study language and do not have any knowledge in technology. The Mexicans were older than us and were working already. It seemed like they knew exactly what they wanted with the product that we were constructing, and it appeared like they did not understand why our knowledge was inferior to theirs.

One of the students (Marianne) came all the way through to the examination, but she missed the examination because she could not manage the Messenger chat room in which she had no experience at all.

The only Danish student that carried through the cooperation (Camilla) says that she was not satisfied with her own technical presentation. She was not familiar with the topic, and she felt that she had too little time to learn all about it. She says:

*"I do not think that is the most important in this cooperation, I mean, to learn all about a different subject, but more closely to be a part of the teamwork and learn to cooperate with a different culture on the internet. I think that some of the Danish students were confused about what to do, and they maybe thought they should learn all about the new subject. I think that is why a lot of the students decided to give up the co operations. They could not handle it.*

The project has been very interesting and the way of virtual communication that we have learned can definitely be used in the future.

We just do not think we could offer any special knowledge to our Mexican study friends: We did speak the same language, but we had no experience in the subject concerned, and we had only limited experience in virtual communication.

# 10. Conclusions

## 10.1. Conclusions related to the POL method in online environments.

This course made evident that virtual learning environments can follow the POL methodology, closely following the implementation of POPBL by AAU. Further, virtual environments become enriched with the learning by immersion method and with the use of tools for collaborative work that enable the interaction between the students in their teams and with the professors-facilitators.

Although the dynamics of the three teams that were selected was different, it became notorious that the teams were expecting for a greater participation of facilitators at certain moments of anguish that took them to demand approval of the work that they were doing, specially at the end of the pre-analysis phase and when they had to look for theoretical sources for the project; that is, mainly in the initial phases of the project. More guidance will of course help, but more planning for the pre-analysis phase is a better solution. One method could be to provide a comfortable mental environment by presenting some project proposals described in the spirit of PBL.

Little by little, the students realized that the work of each member of the team is of extreme importance, since in any other way the product wouldn't have been ready; therefore, a strong group pressure was generated, that can be noticed in the student interchanges related to the responsibility of all to deliver work opportunely and to review what is being done; indeed, this self-pressure about individual responsibility appears throughout the course in students' reflection journals. The performance of the team was frequently referred to by the students as not being acceptable even when facilitators constantly encouraged team performance.

The results were a pleasant surprise as much for the students as for the professors. As can be seen in the final products, each one demonstrates its own style and shows a great wealth of learning and in the products when a greater freedom of action is allowed to the students than when so much direction is given that all the products that are derived from so much direction are almost equal thus restricting the learning and the creativity of the students. However, to the students this effort of creativity, of collaboration is perceived as surrounded by an uncertainty and distresses envelop and disqualification of their work and a continuous demand of attention.

## 10.2. Environment

There are two aspects of the environment that we would like to address: the use of the Twiki tool, and the use of a virtual organization metaphor within the learning by immersion methodology.

The Twiki tool allowed each team to have a virtual space that they could configure the way they wanted. Each team developed a Project Portal in Twiki; that portal held process

documents, intermediate and final results, Twiki talk pages and so on. To produce all these Twiki pages no html knowledge was needed, although several teams did use their knowledge of web editors to enhance appearance of their portal. Twiki kept track of versions of pages within portals and notified team members and facilitators by email when a page was changed. Any team member could enhance any of the documents directly on the browser's interface. All these features made Twiki a very convenient tool to support project work; on the other hand, as it happens with any new technology, students had to spend some time learning the tool.

The organizational metaphor added a note of realism to the course, as the students were role-playing actual work roles as Authors contracted by a virtual organization. Madison had a mission and values consistent with what was expected of the students in the course. Just as in real-life publishing house, no deviations were welcome with respect to agreed dates of delivery of the products.

On the other hand, the user interface of the Madison web pages was a little confusing at the beginning since it did not follow the well known and very structured format that is offered by the electronic platform that is used in the great majority of the remote courses. This caused a little confusion in the students before they were able to command the spaces and contents of Madison-course. The structure of the web pages can be improved to match the participant's background better.

## 10.3. Development of student abilities.

Throughout the course the students developed their social and communication abilities as they had to maintain the group united, to discuss, to make decisions opportunely, to fulfill the interdependent responsibilities that had been assigned to them; since interdependent work and the participation of each member was fundamental for the success of each phase of the project. Therefore also their abilities of communication by diverse means (synchronous/asynchronous) were widely used because the communication was permanent; in this sense the three selected teams stated that it was their best experience with virtual team work, because the social links that were established were very good and the satisfaction for the finished product elaborated was great.

The abilities needed to manage a project following all the project phases were other important abilities exercised throughout the course; through the general guidelines on what was expected in each phase. Each team managed their resources in a unique way, some times under the direction of a leader, other times with the resources and consensual decision making and with the ideas that each member brought to the team. Two of the selected teams agreed that leadership was one of the functions that was more difficult to attain and that caused some sort of impasse until somebody was hopeless and took the leadership role and then others followed him. With greater or smaller speed each team built their product, with greater or smaller care in each part of the same one away constituted the product. . A 'round robin' leadership per phase in the project process is a fine thing, but to overcome starting frustrations and stress the important need for such a leadership, a team coach should be appointed from day one as one of the members of the team.

With regards to cognitive and meta-cognitive abilities, the teams unavoidably had to look for bibliographical support resources, to select the excellent information and reject the less relevant one, to organize the material and give a sequence to the contents of the product. They also developed abilities for the programming and development of Web pages for the

electronic product configuration, abilities which the members that already had antecedents in the area of systems had developed; but not all teams had a member with these antecedents, so for others it was necessary to develop at least the minimum in this sense. All the described activities are cognitive abilities with which the students had to make use throughout the course.

## 10.4. Reflections

The designers of the course, following POL methodology guidelines, designed several instruments for individual, team and course reflection. These instruments forced the students to write up in a systematic form the learning process which they were experiencing so that in writing this they could become more conscientious of their way of learning. Students did these reflections with variable degrees of profundity; in fact the depth of reflection in these students was mainly in a descriptive level. Reflection is not a practice that is commonly held in other courses at ITESM.

## 10.5. Planning and process conclusions

In general, there are two degrees of freedom one can give to the students when working in POL projects – freedom with regards to *whats*, and to *hows*. In this POL-Madison course, the *whats* were quite open – the students could choose the kind of product they wanted to develop and the contents of the product, within only very general guidelines set out in the project theme. This worked very well – there was a great diversity of very creative products. No team learned the same materials as other teams, as it happens in traditional courses; further, the students were very committed to work on a project they themselves had chosen. The *hows* were much more specific, in the sense that the project phases and milestone deadlines were fixed, and there were very concrete suggestions as to what was to be achieved in each phase (Appendix B). Still, these were suggestions, not orders; most students did follow them, others made some changes; in all cases, it was the facilitator's role just to pinpoint possible problems if something was missing. The message never was "Unless you do as you are told your grade will go down to such and such". Rather, the message was always in terms of the success of the project for the students.

There were two problems with this freedom – one, it created episodes of uncertainty and even anguish, as students, accustomed to receive precise instructions, frequently asked: are we on the right track? Is this what *you* want? Although as facilitators we usually bounced back these questions: Do you think this is a valuable product for your intended audience? Why? Is this what your team wants?, near the end of the course Madison Webley Corp. felt the need to issue a set of quality criteria related to process and product of all projects done in the organization, criteria that the Authors could themselves assess. The second problem is the amount of time it takes for project facilitators to keep track of eleven very different projects.

The researchers believe it is *not* a problem that no two teams end up learning the same materials. In all topics, there is some 20% of the possible concepts and themes that causes some 80% of the required learning. It is this 20% that is given out as support material for all project phases; applying this material to the project is one of the things that is assessed in the final assessment.

## 10.6. Outcomes for facilitators

During the course, the professors became attached themselves more to their role of being observers of the process rather than intervening actively in it; and supporting team efforts in the development of their project rather than directing or attempting to standardize the process. For the tutors, as well as for the students, there was a feeling of anxiety especially at the beginning of the course, because we usually guide the students in a more strict and detailed way, and are used to give more detailed.

It does not mean that the tutor can be far from the teams. Tutor must be very close observed what is happening in several of the "spaces" in which that could be some kind of "action", "reflections", "communication" in the portal or outside the portal. The tutor must have a clear idea about each member or the team, each team, each product of the teams and the sequence of the project, etc. In this sense it was a great involved process of facilitator.

Another important fact that the facilitator observed the great variety of products that the course developed usually all the "products" of a course are very similar one to others in this course the products were very different, unique an creative because the teams followed a general instructions but they have the freedom to develop more than this general instructions

## 10.7. Outcomes for the students

The students in the course observed that they developed abilities, learn concepts, developed a product, learned a methodology to solve problems, to take the best of their abilities and to work collaborate They invested more time than in others course because it demands more effort but they have a strong team support and pressure at the same time. Many of the students told that it was the best collaborative work, the best team in all the master degree. They recognize at the end of the course that the less direction that they received form the instructors the more learning and creativity they get.

The students create a product. The product is the share effort of the best of everybody in the team and they experiment a great satisfaction by this way of learning. They immerse in this different learning environment and usually they were compared this course with the real work environments, the facilitators behavior with the boss's behavior and more important, they compared their own behavior in both environments.

# 11. Recommendations

The following recommendations are based on results and experiences from this POL experiment as well as knowledge from AAU and Tec.

**Planning and process.**

- In the POL methodology, students should be given as much freedom as possible to choose the kind of project and product they wish to take on, consistent with a general predefined, wide-open Project Theme
- Project process should be framed in terms of phases with fixed deadlines; however, students should be free to develop their detail objectives, time plans and allocate work tasks within each phase as they see fit. During the POL process token holder roles are defined so every team member tries to be responsible for one or more phases and/or documents. The other members are reviewers on token holder documents.

**Project proposals and team formation**
From day one, a list of project proposals from the university is submitted to the students. Each proposal must be open minded and incorporate the freedom in the text to result in many different solutions. Students are requested to bring up there own proposals too, but the problem to solve must be within the theme description. (In this experiment the theme is described in section 6). The teams can be formed based on project interests and social relations (the last might be difficult due to the on-line environment). Another way to form teams is to let the university do it based on individual characteristics (In this experiment this is done based on Table 2. When the team is formed, a coach is to be appointed by the team.

**Reflections**
We believe it is very important to keep the three levels of student reflection: individual, team and plenary. Here are our recommendations.

*Individual* Students need guidance in reflection. There is an interesting issue here. If the guidelines are too detailed and authoritative ("reflect on this this way, reflect on that…"), the result might not be authentic reflections, but just obeying the professor to the letter. On the other hand, if they are too vague, ("Reflect!") the students might not know what to do. We settled by an intermediate level of detail just presented as "suggestions for effective reflection", making clear that reflections are personal and free format. The results were mixed; while a few students did achieve a reasonable profundity of reflection, others were very superficial. Our recommendation is:

- Do coach, facilitate student reflections. Give feedback on depth of reflection. Assign students to feedback reflection depth of other students.

*Team* It should be clear that team reflections in the Milestone Activities should be a team effort. Initially, some teams assigned to a team member the responsibility of writing up a reflection document for the team. We then issued a guideline: Team members must first reflect individually, then dialog together and combine their reflections. The reflection document in Twiki then first lists individual comments, then the integration of reflections.

*Plenary* Plenary reflections were very useful for students and facilitators. They provided a focused time-frame to "vent" any comments about the methodology and environment and to make suggestions. Hypernews was an effective medium for the two plenary reflections.

Some professors leave a forum open during all the course for comments about the course. It proved more effective to have a concrete three or four day period to make these comments.

**Environment**
A virtual environment for project work should have the following minimum requirements:

- Student teams should have a place in the environment where they can upload and review project documents. The environment must keep track of document versions.
- The environment should also help keep track of time commitments and responsibilities that students assign to themselves
- The environment must facilitate different types of communication among students

We therefore recommend that a special platform with these characteristics be used. Common course platforms such as Blackboard do not fit the bill. Twiki was a fine platform for these

needs. One exampleof a digital platform in use is UniFlex from AAU (Ref. 19: Borch,O 2003)

**Staff training**

The professor that takes the function of facilitating the student process must be trained in facilitation methods, because in general the facilitating process at a distance includes very strong reading abilities, empathy abilities to imagine what is the student thinking and feeling, and abilities to make students feel psychological security while never giving an answer that the students can get by themselves.

The professor can give clues, suggest information resources, help teams to solve their conflicts and always invite the students to reflect about his/her personal learning process, the team learning process, about the product, etc.

It is important also that all the professors that are involved in the facilitation process have common criteria. They must have a close communication among them during the project process.

The professor must be trained in reflection activities (Ref. 12) so that he can facilitate effective reflections.

**Student Guidance**

While the students develop more confidence in their own abilities, they usually ask for strict guidance from the professor. So they demand approval comments about their work and they ask for guidance to solve conflicts inside the team.

The best way to do it is to give a feeling of security that they are in the proper way looking resources, method, and solutions. But it is important that students learn the content by themselves; further, that they become aware about the ways of their own learning processes, their own abilities to solve problems, the way in which they collaborate in the teams and so on.

**Transfer to on-campus POL courses.**

This POL experiment can easily be mapped into an on-campus activity. The principles for development are the same, but communication for the students is faster face to face and thus to plan the POL process, take decisions, organize time and resources. The main obstacles will be to change the mentality of on-campus professors to have the project as the leading motivator and tool for the learning goal. Another problem is to incorporate more than one traditional course for the POL support.

**Facilitation**

- The facilitator must ***follow, not lead***, the students work. Make suggestions, don't give orders. Ask, don't tell: Ask questions, don't give answers. Learn, don't teach. Be a learning peer, not a boss. Help students grow, not control their growth. Respect the way the students have decided to work, communicate and set up their work space. Facilitator must be prepared to be surprised by students. He/she must frequently observe the team communication in the documents that the team produces about their communication (For this course, twiki talk pages, hypernews messages and chat logs); ask authentic questions (whose answer he does not know so that he can learn from his students); bounce back students' questions with further

questions that encourage deeper reflection; pose questions that the students should be asking themselves; be careful not to issue "loaded" questions that incorporate judgments or answers; and give constructive feedback on quality of work and application of support material.

-

**Course and project design**

- Do a project supported by course material; not a course with a project. Appears the same –but this difference is crucial.
- Allow as many degrees of freedom as possible with regards to the *whats* of the project. *Hows* could be more strict. The natural tendency of professors coming first time to POL is to over-specify projects

# 12. Further research

1. In the reflection area, it is wanted to strengthen the activity to generate more reflections and thereby improve learning. Instead of just recording what was made in the project in the blog's, it is better to put up questions stimulating other questions. The best is to let the students form the questions and thus making a kind of peer reflection forum. The problem is to find methods for stimulating such activities not to overwhelming people but to strengthen progress in the learning process.
2. How can we be sure about outcome learning abilities and to what extend is it transferred to the real world. The problem is to measure outcome and compare 'before and after' and 'POL and non-POL'. An idea could be to arrange a play with observations before and after a POL experiment. This is difficult on-line, but could be performed on-campus.
3. Written chat is well known and often used, but audio chat is very power full to bring people mentally and social much closer to each other and increase information flow. Also audio chat has been used for on-line examination, which open up for a larger amount of control ex. validating voices.

# 13. Future plans

1. Madison as capstone project course.
    a. The Madison Organization is currently being proposed as a platform for a "capstone project course" in the master's for IT management program, both face to face and online versions. The idea is that all the courses a student takes would act as a sort of "p-courses" for this capstone project. Madison would then welcome digital product projects in all areas of knowledge related to the master's degree, not only Learning Organization projects. This requires only minimum changes to the current organizational structure; new Thematic Divisions would be added to the existing one (LO) to cover additional content topics for projects. The project methodology would still be practically the same, since it is quite general already. Writing is a great way of learning; producing a digital product chosen by student teams is then a very good way of affirming knowledge obtained in courses.
    b. Another change that is being proposed is to free up time requirements for projects. A new digital product project could in principle start whenever five students get together to do it and end when they finish: these dates need not coincide with the start and end of academic terms. After all, in a real life

publishing house, editorial projects can start and end at any time. This would however require rather radical changes to academic administration, and can perhaps be more easily accommodated in online rather than in face to face courses.

2. Joint POL where the project is a joint activity between students at both sides and the supporting course(s) are locally given or/and offered as shared on-line activities. The POL must be in English and it is recommended to have projects within a theme which – in this beginning – should be rather concrete ex. within engineering education. The professor and facilitator team must know all conditions for the activity and commit themselves to follow the process defined by a controls group formed by persons from this POL research experiment. A final on-line exam is performed. The time for the project work and facilitation is taken from the courses, but the time needed to turn courses from a teaching environment into a learning environment must be reserved, although a template for such courses has already been proposed (Ref. 19: Borch, 2003).
3. One or more POL activities in the PBL area for professors. This could be a project and some on-line support courses form a master program ex. MPBL http://www.mpbl.aau.dk/ . The professors are forming a team solving a problem in the POL area. The project could focus on the POL process, reflections and facilitator roles ending up with guidelines and a staff training program. A final exam is performed.

# 14. Acknowledgements

Alina Lizu Larrondo (page design, web programming)
Antonio Dieck Assad (project support)
Camilla Solberg (Danish student helper and a participant)
Egon Moesby (project support)
Ema Castillo (Twiki tool installation)
Fernado Jaimes (project support)
Finn Kjærsdam (project support)
Jose Escamilla (project support)
Maria Elena Morin (project support)
Ole Rokkjær (Reviewer)
Perla Salinas (Project facilitator)
Peter Thoeny (Twiki creator)

# 15. Bibliography

**Ref. 1 F. Kjærsdam, S. Enemark (1994)** *The AAU Experiment –project innovation in university education*, AAU,Press, 1994

**Ref. 2 Knudsen M. , Borch O. , and Helbo J. (2004).** *Didactics, Technology and Organisation of Project Based Distance Education.* The Electronic Journal of Information Technology in Construction, ITcon.

**Ref. 3 F K Fink** *Work-Based Learning in Continuing Professional Development*, Chapter 10 in Engineering Education and Research - 2001, a Chronicle of Worldwide InnovationsISBN 1-56700-186-6, iNEER/Begell House, USA, 2002

**Ref. 4 Hypernews** http://www.hypernews.org

**Ref. 5 Icaza, J. I. (1997a).** *Aprendizaje por inmersión en una empresa simulada en internet*. Memorias del XV Intercambio de experiencias en estudios sobre educación. ITESM campus Monterrey 1997. http://copernico.mty.itesm.mx/~jicaza/papers/inmersionIntrkmbio97.html

**Ref. 6 Icaza, J. I. (2004)** *Learning by immersion in virtual worlds.* Transcription of an informal talk that summarizes 7 years of work in this approach to learning, with links to papers and courses http://copernico.mty.itesm. mx/~jicaza/presentations/ScriptMundosVEnglish2.htm

**Ref. 7 Twiki tool** to download: http://TWiki.org

**Ref. 8 http://minnow.cc.gatech.edu/swiki/4**

**Ref. 9 Examples of intranet implementations in Twiki**: http://twiki.org/cgi-bin/view/Main/TWikiSuccessStories

**Ref. 10 Wikipedia: A** whole encyclopedia in a wiki server: **http://en.wikipedia.org/**

**Ref. 11Team role questionnaire and description of team roles.**
http://www.teamtechnology.co.uk/workingoutyourteamrole.htm accessed 14 april 2004

**Ref. 12 Søren Hansen et.al.** *Teaching and Learning Competencies by Experimenting and Reflecting*, Allborg University. To be published in Das Hochschulwesen, Universitæts Vorlag Webler

**Ref. 13 Martin, M (2002)** El *modelo educactivo del Tecnológico de Monterrey*. Tecnológico de Monterrey 2002.

**Ref. 14 Bodgan, Robert C and Biklen, S. K. (1982)** *Qualtitative research for education: an introduction to theory and methods.* Allyn and Bacon 1982.

**Ref. 15 Belbin, R. M. (1993).** *Team roles at work*. Butterworth Heineman 1993.

**Ref. 16 Icaza, J. I. (2001**). *Construcción de conocimiento en una empresa editorial virtual*. Memorias del Congreso de Investigación y Extensión. ITESM campus Monterrey 2001
http://copernico.mty.itesm.mx/~jicaza/papers/104ConstrConocimien.htm

**Ref. 17 Team Role Questionnaire and description of resulting Team Roles:**
http://www.teamtechnology.co.uk/workingoutyourteamrole.htm

**Ref. 18 Kitchin, Jan Lovie (2001).** *Reflecting on assessment*. Chapter 20 in Schwartz, P., Mennin S. and Webb G., *Problem Based Learning: case studies, experience and practice*, Kogan Page Ltd 2001

**Ref. 19 Borch O. , Helbo J. , Knudsen M. , and Rokkjær O. (July 2003).**
UniFlex A WWW-environment for project-based collaborative learning. ITHET'03, 4th International Conference on Information Technology Based Higher Education and Training, Marrakech, July 2003.

# 16. Appendixes

Most of the documents linked to in appendixes are in Spanish. To obtain an approximate English translation you may paste the links into the "Translate a web page" field of Google's free translation service at http://www.google.com/language_tools?hl=en

## A Definitions and acronyms

| | |
|---|---|
| AAU | Aalborg University, Denmark |
| blog | Reflective individual log on the web (weblog~blog) |
| Coach role | "Coaches try to create harmony in the world around them, by building rapport with people, creating a positive team atmosphere, looking after people's welfare, motivating people and/or providing a service to the satisfaction of others." ( Ref. 17) |
| Crusader role | "Crusaders give importance to particular thoughts, ideas, or beliefs. They are value driven, and in a team discussion they often bring a sense of priority that is derived from |

| | |
|---|---|
| | their strong convictions." ( Ref. 17) |
| Curator role | "Curators bring clarity to the inner world of information, ideas and understanding. They listen, ask questions and absorb information, so that in their mind's eye they can achieve as clear a picture or understanding as is possible." ( Ref. 17) |
| Cybernauts | "Residents" of cyberspace |
| Explorer role | "Explorers promote exploration of new and better ways of doing things, to uncover hidden potential in people, things or situations." ( Ref. 17) |
| Facilitator | A person helping the team to bring forward the process and the product |
| Hypernews | Web based discussion forum manager software |
| IT | Information technology |
| POL | Project Oriented Learning |
| POPBL | Project Oriented Problem Based Learning |
| Professor | A teacher in an academic institution |
| Scientific role | "Scientists provide explanation of how and why things happen. They bring structure and organization into the inner world of ideas and understanding." ( Ref. 17) |
| Sculptor role | "Sculptors bring things to fruition by getting things done, and getting them done now" |
| Tec | Tecnológico de Monterrey, México. |
| Token holder | A person responsible for document and process development within a project activity |
| Tutor | A university educator who leads a task-oriented group to successfully achieve the objectives of a teaching program. |
| Twiki | A tool in the category of Wiki Servers. Twiki was developed by Peter Thoeny |
| Wiki server | Type of tool that supports "wikis": sets of interlinked web pages that can be quickly constructed directly on the browser's interface as supported by the server without having to know about html, web editors, URLs or directory structures. Wikis can thus be used for collaborative document development and team collaboration. Wikis were invented by Ward Cunningham. |
| Wikipedia | A complete encyclopedia on a wiki, built by cybernauts. |
| SIS | Spanish International Studies |

## B Process documentation guidelines and calendar

Figure 3 shows the process activities in the POL experiment.

| Phase | Activities | Date |
|---|---|---|
| **Phase zero** | Initial activities (ActividadesIniciales) to familiarize with Madison and its technology | First block of inicial activities: Saturday 20 september Second block: Tuesday 23 |
| RI individual reflection blog | Write down your individual reflection | RI Tuesday 23 |
| **Phase 1 Pre-analysis** | Decide about thematic of your product, audience, kina of product and problem or opportunity | Weeks 2-4 (24 september - 12 october ) |
| RI individual reflection blog RE Milestone Activity. (Team reflection) | Write down your individual reflection and also develop your team reflection | RI by the end of each week RE at end of phase |
| **Phase 2 Analysis** | Bibliographic research. Structure and organization of product | Weeks 5 and 6 (13 october to al 26 october) |
| RI Individual reflection RE Miloestone activity RP Plennary reflection | Write down your individual reflection and also develop your team reflection. Participate in the hypernews forum for the Plennary reflection. | RI at the end of each week RE at end of phase RP First plenary at end of phase |
| **Phase 3 Design** | Decisions about format (presentation,fonts, ilustrations, style and so on); Details of the user interfase; dynamic and static architecture of product | Weeks 7 and 8 (27 october to 9 november) |
| RI Individual reflection RE Milestone activity | Write down your individual reflection and also develop your team reflection. | RI by the end of each week RE at end of phase |
| **Phase 4 Implementation** | Integration of all product contents and Assembling and realization of product; validation | Weeks 9 to 11 ( 10 november to 30 november |
| RI Individual reflection RE Miloestone activity RP Plennary reflection | Write down your individual reflection and also develop your team reflection. Participate in the hypernews forum for the Plennary reflection. | RI at the end of each week RE at end of phase RP Second plenary at end of phase |

**Figure 3 Snapshot from Twiki showi ng process activities organized in 5 phases.**

For more information please consult
http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/MetodologiaDeProyectos#Descripci_n_de_cada_fase_del_pro

Version in English from where the image in Figure 3 was taken.
http://copernico.mty. itesm.mx/TWIKI/bin/view/Madison/CalendarEnglish

## C Role descriptions

Link to description of the roles of Authors and Editors (i.e., students and facilitators)
http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/DescripcionDeRoles

## D Reflection guidelines: individual, team and plenary

The next links contains guidelines to the students when making reflections in different forums.

Individual log reflection:
http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/BlogsDeReflexion
Team reflection:
http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/LineamientosMilestone
First plenary reflection: http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir1055/f1/1.html
Second plenary reflection: http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir1056/f1/2.html

## E Student profiles guidelines

Students filled up a Student Profile that was stored on the Twiki page belonging to each student. The following link points to guidelines for writing up the profile:

http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/DesarrollaTuPerfil

## F Twiki flash tutorial:

This link points to an animated tutorial of the Twiki tool
http://www.ruv.itesm.mx/cursos/maestria/mati/sep03/si271/recursos/tutorialTwiki.htm

## G Student's individual reflection logs ("blogs")

http://copernico.mty.itesm.mx/TWIKI/bin/search/Main/?scope=topic&search=blog

## H Team products:

Link to the project portals of each team:
http://copernico.mty.itesm.mx/TWIKI/bin/view/Madison/ProyectosActuales
Within each portal, there is a link to the final product developed by the team. Here is one example –the final product of Team 1:
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/ProductoFinalE01

## I Project Portals

**Common for all teams**

First plenary session log
http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir1055/f1.html
Second plenary session log for teams 2, 4, 6, 8 and 10
http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir1056/f1.html
Second plenary session log for teams 1, 3, 5, 7
http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir1056/f2.html

**Portal team # 1**

http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/ProyectoUno

Individual "blogs" members # 1
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogAbelC
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogClaudiaR
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogFranciscoM
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogJorgeL
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogCleliaH

Team 1 log
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/BitacoraDialogosEquipo1

Phases of the Process
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/PlanFaseUnoE01
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/PlanFaseDosE01
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/PlanFaseTresE01
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/PlanFaseCuatro01

Final product.
http://copernico.mty.itesm.mx/TWIKI/pub/Mwp01/FaseCuatroE01Talk/ElMapeodeconocimientook.exe

Process Report
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp01/ReporteProcesoE01

**Portal team # 6**

http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/ProyectoSeis

Profile team members
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/PabloCh
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/NorbertoM
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/RubenM

http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/MarianneNielsen
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/ManuelaG

Discussion team forum
http://hn.ruv.itesm.mx/hn/pgit/get/sep03/si271/dir860/f1/1.html

Team Log
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/BitacoraP06

Phases of the Process
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/PlanDeTrabajoAnalisisP06
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/PlanDeTrabajoAnalisisP06
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/PlanDeTrabajoDisenoP06
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/PlanDeTrabajoImplementacionP06

Milestones
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/MilestonePreAnalisisP006
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/MilestoneAnalisisP006
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/MilestoneDisenoP06
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/MilestoneImplementacionP006
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/MilestoneReporteIntegradoP006

Report of the Process
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/ReporteIntegradoP06

Final Product
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp06/ProductoFinalP06PaginaPrincipal

**Team # 8**

Team Log
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/ProyectoOcho

Working Plan
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/PlanTrabajo

Individual blogs
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogAlejandroH
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogBelindaC
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogFranciscoP

http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogHeidiC
http://copernico.mty.itesm.mx/TWIKI/bin/view/Main/BlogYolandaG

Phases of the process
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/DocumentoProblemaOportunidad
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/IndiceProducto
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/DocDisenioPdcto
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/ReporteProceso

Milestones
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/FaseUnoMilestoneRE
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/FaseDosMilestone
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/FaseTresMilestone
http://copernico.mty.itesm.mx/TWIKI/bin/view/Mwp08/FaseCuatroMilestone

Final product
http://www.prodigyweb.net.mx/yolandagzz/