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Learning Approaches - Final Report Sub-Project 4

ELAC - European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning, Prepared for the European Commission, @LIS Europe Aid Co-operation Office under the contract ALA/2002/048-740

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Learning Approaches

Final Report Sub-Project 4

Period: 01-10-2003 – 31-09-2006



European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning

PROJECT NUMBER

ALA/2002/048-740

Leader of the Consortium

Institute of Environment & Resources
Technical University of Denmark



Sub-Project Management

e-learning lab
Aalborg University



Universitat de Barcelona



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The ELAC project started on 1 October 2003 and concluded on 30 September 2006, representing 3-years of excellent collaboration and results.



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Executive Summary

The overall aim of Subproject 4 is to apply learning approaches that are appropriate and applicable using ICT. The task is made up of two components 4.1 dealing with learning approaches (see deliverable 4.1), and component 4.2 application of ICT (see deliverable 4.2, deliverable 4.3 & deliverable 4.4 (in Spanish), and deliverable 4.5. (in Spanish), which are attached in as Annex 1, 2, 3 and 4. Deliverable 4.1 provides a conceptual framework that has inspired the learning approaches in ELAC. The deliverable presents an overview of the overall approach and methodology used within the project, followed by a presentation of learning approaches, and the identification of pedagogic concepts and tools applied in e-Learning. The deliverable moreover has a list of produced working papers and articles from partners within the ELAC project with relevance for deliverable. Deliverable 4.2 focus on establishing an experimental infrastructure; Open-source software, Moodle as the learning management system and virtual learning environment (VLE); Pedagogical considerations on the selection of an open source virtual learning environment; Testing of pedagogical concepts and tools; Conceptual framework for the virtual learning laboratories and Resources for the virtual learning laboratories. Deliverable 4.3. & 4.4. (one report) focus on the capacitation programme developed for the Latin American partners. Moreover, it includes a description of the pilot courses developed of the Latin American partners. Deliverable 4.5 presents the training courses provided to the Latin American partners.

Based on the ELAC project with respect to sub project 4 we can make the following recommendations:

The *action research* approach seems to be very appropriate in projects like ELAC. Action research takes point of departure in the actions and dialogues among competent practitioners. Bringing the experiences and expertise of European and LA-partners together have created a very rich learning environment for the development of pilot courses, and for preparing the Latin American and European universities for the 21 century. The ELAC project has provided a solid foundation for integrating ICT putting pedagogical reflections and learning in the foreground. In contrast to more traditional implementation projects which focus on building up the technical infrastructure, the ELAC project has made learning the centre for development and making pedagogical design, ICT and organisational change the supporting tools.

The development of pilot courses have given the universities a new portfolio of networked learning environments, however *as* important, the development of pilot courses have made it possible for the participants to acquire tangible experiences and learning through the development of their own courses. In that sense the development of pilot courses are embedded in a transformation strategy in which the partners get concrete experiences with the many different aspects of virtual learning; experiences which can be used for developing theories and strategies in a broader sense.

The ELAC project has shown that an open source learning management system as Moodle can be applied in many different ways depending on the local conditions and aims. The pilot studies support the view that each environment is unique and requires a specific design and realization. Given the situated uniqueness, the way a LMS or other ICT tools constrain and afford learning activities are not absolute; affordances and constraints must be considered in relation to the characteristics of the specific context, the needs, the motives, and abilities of the participants, and the kind of activities to be supported. In general, pedagogical designers, professors and students have been very satisfied with Moodle, the LMS used by all partners. Moodle has provided adequate tools and resources for teaching and learning, and the interface has been inviting and intuitive.

The overall approach in the ELAC project has been inspired by socio-cultural and socio-constructivist approaches in a broad sense, and there has been a massive interest in applying elements of problem oriented project pedagogy. The specific pedagogical designs have been pragmatic compromises – on one hand inspired by newer theories on learning, on the other hand to respond to what is practically realizable. However, what is very important is that the ELAC project has created an environment for continuous improvement and development of the learning environments. Developments which are incremental, but in

the long run may lead to radical changes as professors, pedagogical designers and managers get more and more insights and experiences with ICT and learning.

The overall approach within SP 4 may be labelled a dialogical approach – both in the relation between partners and participants in the overall project approach, and in the pedagogical approaches applied in the pilot courses. New virtual means such as forums, chats, blogs, wikies etc. (so called web 2.0) support this approach in the day-to-day management of the project and in the development of courses. The ELAC project has been successful in taking up these new tools, which brings the course development in the ELAC project pedagogically and technologically in the forefront. The institutional backup further sustains the approaches and activities within each university, but has also contributed to the development of a national agenda on ICT and Learning as an integrated approach of pedagogical, technological and organisational change.

ICT is in general viewed as a vehicle for change and development, which fosters interaction and relations between academia and society in a lifelong learning perspective. Moreover it supports national, regional, and international cooperation within research and education, support innovation within teaching and learning and contributes to the development of a learning culture. Finally, it enables more effective administration procedures, e.g. online registration.

The overall conclusion is that the ELAC project has provided the Latin American partners with visions and tools for a solid integration of ICT into the university practice as well as ELAC has established a fertile ground for a development strategy based on the integration of pedagogy, technology and organisational changes.

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1. Introduction

1.1 Presentation of the Report

This is the Final Report for Sub-Project 4, relating to the “Learning Approaches” of the ELAC project under the EU’s EuropeAid Programme @LIS. The report is based on data and reports provided by partners, as well as direct observations from the sub-project manager. All relevant documentation can be found in the Virtual Collaboration Environment (VCE) established for the project at the following website: www.elac.dk and www.elacvirtual.net.

The objective of this report is to organise and consolidate the extensive documentation and information available on the sub-project activities and outputs. At the same time the intention is to publish and publicise the availability of this information to a wider audience through the VCEs. This report covers the entire duration of the operation, from 1 October 2003 through 30 September 2006.

The structure of the report follows the format provided by the Commission. The report is supplemented by a number of annexes, which include documents, websites or reports that make up deliverables from the project.

1.2 Project Overview and Context

Summary

The ELAC project has sought to improve the quality and accessibility of education in the key field of Environmental Management and Planning by developing innovative and multilingual courseware through an Information Society Technology (IST) based education programme.

The overall objective of the ELAC project has been to demonstrate how IST-based approaches within universities in a cross-cultural environment and within a multidisciplinary field can improve and enhance the quality and accessibility of education within the context of university programmes and life long learning (continued professional development) and knowledge dissemination and interaction with stakeholders and the civil society.

Main Activities

To achieve the above, the project implemented a platform that applied the latest web-based technologies that enabled the deployment and development of an innovative and multilingual Virtual Learning Environment (VLE) and Virtual Collaboration Environment (VCE). This platform is an Internet based web-portal that is open source and thus adaptable and can be easily replicated.

Appropriate, innovative and varying learning approaches and methods have been applied for the implementation of IST-based courses and project work in the field of Environmental Management and Planning. The project will aim at using IST as a catalyst for change and for development of problem- and action-oriented learning approaches and methods. It also aims to further develop curricula and methods within Environmental Planning and Management taking into account cultural diversity, problem areas in the participating countries and social and economic conditions.

Courses were developed, implemented and run within the VCE/VLE, which was also used as the basic communication and collaboration tool. This process, along with the exposure of promoting the availability of these cross-cultural, multidisciplinary courses, has served to demonstrate how IST can enhance the learning process as well as effectively disperse its availability to a larger audience, in particular those outside the formal education and training setting.

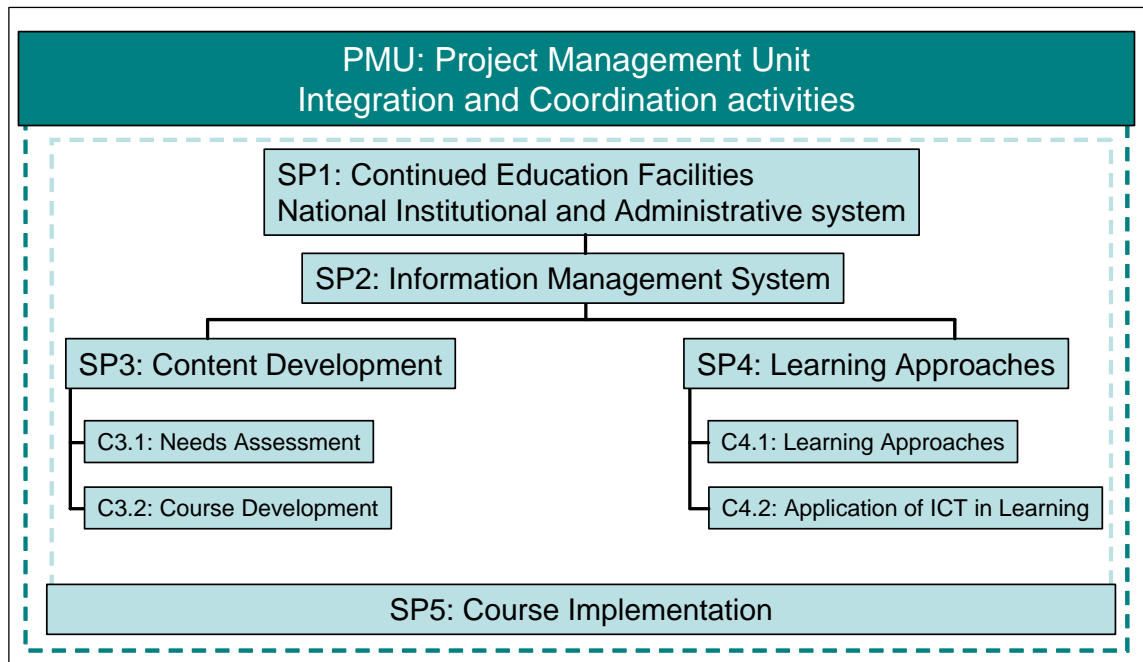
Expected Results

It was envisaged that the successful implementation of this project would stimulate further development and collaboration that would make this initiative sustainable beyond the lifetime of the project. An important element to achieving this success has been in ensuring that institutional and administrative procedures were put into place at the participating universities so as to embed IST-based approaches into the existing education structure. Additionally, the existence of local expertise, infrastructure and eLearning-tools after the project enable the work to continue. ELAC will, in the future, take the form of a non-profit-making association known as *ElacVirtual*, which will continue to offer training and promote the project once the @LIS programme comes to an end. Experiences from the project has also been carried on to Kaleidoscope, the European Network of Expertise on technology enhanced learning and will also inspire the work of VIT@LIS, which is an international association for the exchange, dissemination and valorisation of innovative experiences with information and communication technology.

Organisation

The project was organised into a number of subprojects, as shown in the diagram below.

Figure 1.1: Structure of the ELAC Project



Approach

Each sub-project has a specific objective and role to play in the project and all the sub-projects were interrelated, requiring a high degree of organisational management and communication between sub-projects. The ambition has been to ensure that competent teams developed at each of the Latin American Universities enabling them to continue the work, using the expertise gained by the interventions from experts within each of the sub-projects; but also very much through working together locally, regionally as well as internationally.

Training programmes, workshops, hands-on development sessions, on-line collaboration and on-line meetings have all served as mechanisms to enable the transfer of knowledge and creation of local teams working together as a cohesive multidisciplinary group. These local groups are enhanced by the fact that there are other similar groups within the region that can support and

supplement their efforts. These groups also function as catalysts for expanding the impact of the work realised by this project.

Finally, it should be noted that the driving force in the project is the design of on-line Environmental Courses at Latin American Universities meeting the unique needs identified in each country and the relevant expertise available at the universities.

Partners

The project consortium was made up of 8 partners in 6 countries, each with a specific role, as presented in the following tables:

Table 1.1: Project Partners

Nr.	Partner Name	Acronym	Country
1.	Technical University of Denmark	DTU	Denmark
2.	Aalborg University	AAU	Denmark
3.	Lancaster University	LU	United Kingdom
4.	Universitat de Barcelona	UB	Spain
5.	Universidad Nacional	UNA	Costa Rica
6.	Universidad Nacional Autónoma de Nicaragua	UNAN	Nicaragua
7.	Universidad Centroamericana	UCA	Nicaragua
8.	Universidad Autónoma Metropolitana - Azcapotzalco	UAM	México

Table 1.2: Role and Function of European Universities

Partner	Acronym	Role and function
Technical University of Denmark	DTU	SP 0 Project Management SP 1 Continued Education SP 2 IMS SP 3 Content Development
Aalborg University	AAU	SP 4 Learning Approaches (Co-managed with UB)
University of Barcelona	UB	SP 4 Learning approaches (Co-managed with AAU)
Lancaster University	LU	SP 5 Implementation of Courses: 5.2 Evaluation

Table 1.3: Role and Function of Latin American Universities (SP 0-5 all subprojects)

Partner	Acronym	Role and function
Universidad Nacional	UNA	SP 5 Implementation of Courses. Implementation at own university
Universidad Centroamericana	UCA	Implementation at own university. Regional coordination.
Universidad Nacional Autónoma de Nicaragua	UNAN	Implementation at own university
Universidad Autonoma Metropolitana - Azcapotzalco	UAM	Implementation at own university

2. Sub-Project Description

The information society calls for new competencies, innovative teaching and learning approaches. Information Communication Technology (ICT) is viewed as a catalyst for transforming universities and preparing them for the 21st century. ICT should be applied in the most feasible manner in accordance with the pedagogical aims, limitations in technology (accessibility of computers, functionality etc.), the subject area, and the target group. Throughout the project dialogue- and problem based collaborative learning methods organised in mixed-mode learning environments have been applied.

The application of innovative teaching and learning methodologies like project based learning, collaborative learning, dialogue based interdisciplinary group work are required in order to support the learning systems in both the European region as well as the Central American region. A great challenge is to apply these approaches and combine them with ICT tools. Thus the educational programme should develop into a collaborative learning, dialogue-based system where real-life situations and problems are of concern. The learning approaches and the exposure to knowledge need to be carefully targeted to specific groups and purposes in accordance with their needs. The result of the subjects identified in the needs assessment under Subproject 3 (Component 3.1) should be matched with relevant subjects or problems, e.g. requirements in environmental management instated in new regulation or laws.

2.1 Objectives

The objective or project purpose for Sub Project 4 is stated in the Grant Contract (ELAC, 2003) as follows:

To apply learning approaches that are appropriate and applicable using ICT

The expected outputs are related to the activities for sub-project 1 stated in the Grant Contract (LFA) as follows (4.1-4.6):

- Component 4.1 Learning approaches
 - Identification of pedagogic concepts and tools applied in eLearning and identification of applicable virtual communication tools (4.1.)
 - Establishment of a virtual learning laboratory for the assessment of applicable concepts and tools (4.2)
- Component 4.2 Application of ICT
 - IMS as a tool for course development (4.3)
 - IMS as a tool for web-based education (4.4)
 - IMS as an educational provider of continued education courses (4.5)
 - Capacity building of key personnel (4.6)

We see the establishment of a virtual learning laboratory for the assessment of applicable concepts and tools (4.2) as the experimental setting for the application of ICT and for the tasks: IMS as a tool for course development (4.3), IMS as a tool for web-based education (4.4), IMS as an educational provider of continued education courses (4.5) and Capacity building of key personnel (4.6). The need for capacity building of key personnel was identified early in the project, and Project component 4.6 was amended the original grant contract after approval by the EU.

We have prepared four deliverables from Subproject 4 (included in the annexes: 2, 3, 4 & 5), which are available as separate reports:

4.1 Conceptual framework of the innovative teaching and learning methods

4.2 Establishment of a virtual learning laboratory for the assessment of applicable concepts and tools

4.3 and 4.4 Training and implementation plan. Capacity building of key personnel in Pedagogic Design, Development and Practice in Virtual Learning Programmes

4.5 and 4.6 Pilot courses and workshops for educators

3. Approach and methodology

The overall approach and methodology of Subproject 4 reflects various traditions within the overall framework of *action research* and the newer tradition within *participatory research* and *design-based research*, but also constructivist and socio constructivist approaches to learning such as the widespread approaches of problem based approaches.

These approaches all reflect an active engagement of participants, not only cognitively but also through concrete experimentation coupled with theoretical reflections. Rather than taking an expert vs. non-expert or teacher vs. student approach where we as pedagogical “experts” would train and deliver to the participants a definite methodology on “pedagogical design”, we aimed at involving and engaging with the participants’ existing experiences of teaching and doing pedagogical design through dialogue; essentially because they are all experienced lecturers and educators. One aim was to connect to the existing knowledge and practices of participants as to enable a reflection on current practice and how this could feed into online pedagogical design. But, also to enable reflections on how the use of online learning could give opportunity for changing pedagogical perspectives.

This is theoretically inspired from Donald Schön’s work on the notion of “The reflective Practitioner” (Schön, 1983), which draws lines back to action research and experiential learning. The online pedagogy of the different courses has emerged from the practical experience of teaching from both parties (teachers and pedagogical designers), the theoretical background knowledge of the pedagogical resource persons and the theoretical insight of the teachers within the subject matter. In this sense we understand the courses that have been developed as a collaborative enterprise between pedagogical designers and the teachers in the project.

Included in the strategy for changes were the development of a comprehensive ELAC training programme, the development of a virtual learning laboratory, collaborative work on pilot course developments, workshops and conferences.

3.1. The ELAC training program

It became apparent that an extensive training program, in the context of learning and technological applications within the ELAC project, which could respond to the needs of our partners was clearly required, with the understanding that our Latin American partners had very limited experience in the use of ITC training courses within and outside the university environment.

Needs analysis. The ELAC training course came about after analysing the training requirements of our Latin American partners. This needs analysis focussed on the differences between the different countries and varying degrees of ICT implementation and was based on the following proposed items:

1. Brief description of each partner: current technological capacity, previous initiatives in the use of ITC, and relations with other partners.
2. Aims and reasons for developing virtual courses.
3. Problems and needs.
4. User profile
5. Training requirements
6. Extent of training
7. Scheduling
8. Courses envisaged
9. Open description

The needs analysis questionnaire was responded to by all our Latin American partners. Once all the information and specific requirements for each one of our Latin American partners was collected and analysed the plan was drawn up.

The aim of the training course was to facilitate and support the implementation of virtual courses and projects covering the fundamental aspects of the courses, as well as applied aspects – the main aim of ELAC – while also focussing on trying to train professionals in each institution who would be able to provide the most appropriate training during and after the courses.

The training program was, logically, a compromise between the particular demands of each partner and the actual possibilities (personal, economical, availability ...) the ELAC program could provide. In order to achieve this, all the results were gathered, analysed and adjusted in accordance with the technological and pedagogical orientation of our European partners and their training capabilities. The whole program attempted to answer in the best manner possible almost all the requests made with the exception of those deemed inappropriate such as particular requests for training for specific and specialised ICT applications which were not within the environment or objectives of the project.

Training plan. The plan drew together all the requests of the Latin American partners and was organised according to four basic criteria:

1. Reorganising of training program content. The content was split into four training blocks which responded to the needs and pedagogical orientation of the partners in the ELAC project.
2. Distribution of training according to targeted user type. The targeted users were recognised as being pedagogical designers, course content experts, technicians and material developers and training managers.
3. Timetabling. The training program would be over 30 months, from June 2004 to September 2006, distributing the content and initiatives throughout this period.
4. Course and workshop. The courses and workshops were presential or virtual or hybrid.

The final trainings blocks were:

- Technological basics (basic level)
- Technological basics (advanced level)
- Pedagogical design
- Learning theories
- Course development
- Multimedia production
- Virtual learning and tutorial
- Course medium and platforms
- Course evaluation
- Practical workshops
- Strategic planning on the use of virtual learning environments in universities.

A detailed plan of the training can be seen in the figure where all these elements are outlined along with the designated partner to coordinate each of the initiatives and a brief rundown of the timetabling required for each course (see deliverable 4.3 and 4.4 in Appendix 4).

In all, a total of 11 different courses have been prepared with 20 distinct training initiatives carried out over a period of 3 years. Special mention is worth drawing to Module 3, developed in Europe, aimed at our Latin American pedagogical designers, with between 4 and 6 people travelling back and forth every year between the universities of Aalborg and Barcelona.

4. Achievements and Results

In the following sections we shall highlight some of the most important outcomes of the ELAC-project, which we certainly don't think can be attributed to subproject 4 in isolation. Rather, we perceive the results and outcomes of the project as an outcome of all Subproject's work and each participant in the project has contributed to the overall outcome of the project. Important tools, from our perspective, are the pilot courses - online and mixed modes course environments that have been both a driver and a product of the project.

4.1 Learning Approaches

As stressed in deliverable 4.1 (Annex 2) there are multiple ways of designing, using and conceptualizing online learning. Therefore we have seen the work of Subproject 4 not only as delivering specific heuristics or design guides on "how to create online courses", but rather to give the partners some tools to analyze their needs, their current pedagogical approaches and the available tools. There is a huge difference between designing a one-week course for on-campus students on how to use e.g. Photoshop or GIS and then designing for a semester course in which professionals engage in field work, laboratory experiments or pursue their own projects through a PBL/POPP approach. Thus, we have not aimed at delivering a specific model, but rather to give the partners some analytical tools or sets of questions from which they can reflect on current and future practices. The "methodology" takes at its core the transactional relationship between three elements that affect and is affected by the learning taking place: pedagogy, ICT-tools and organisational aspects. The methodology implies that we believe the core of course design to be the "pedagogy" but the pedagogical approach is dependent on and will influence the other elements; and all of the elements also affect each other. Based on this approach have been developed a model for pedagogical design (see deliverable 4.1) including three elements: 1. Elements of overall course design, 2. ICT-Tools, and 3. Elements of teaching practices and methods.

Another important insight is the relational and indirect approach to understanding technology and pedagogical design (Jones, Dirckinck-Holmfeld, & Lindström, 2006). Though systems might support some pedagogical approaches better than others and afford and constrain in different ways certain activities, there is not a direct relationship between technology and the pedagogical approach. One can utilize a system creatively or one can use the system in other ways than might have been anticipated by the designers. Secondly, there is no direct relation between a pedagogical design and then how the course may actually be carried out in practice. One may find very nicely designed environments that should in principle/theory optimally support dialogues and discussions, but nothing is happening. One thing is planning and designing a course, another thing is actually carrying it out, which is dependent on many other factors. Students might be bugged down by other obligations; they may not be interested in the topic and the teacher may be too busy. (Wenger, 1998) formulates it as follows: "*(design is) a systematic, planned, and reflexive colonization of time and space in the service of an undertaking (ibid. p.228)*. Learning is not a result of design, but a reaction to it, because: "*Ultimately, it belongs to the realm of experience and practice. It follows the negotiation of meaning, it moves on its own terms. It slips through the cracks; it creates its own cracks. Learning happens, design or no design*"(*ibid. p. 225*)

In the following we shall try to differentiate between some very general traits of all the courses, but we cannot fully unravel the pedagogical creativity or the vast number of ways all of the different courses have been designed. Instead we shall outline some very general distinctions and archetypes.

First of all we would like to emphasize the differences between on-campus and off-campus courses and two different modes of organisation: mixed mode (hybrid) or fully online (virtual) (the matrix can be found in Deliverable 4.1 p. 22). All types of courses have been represented in the ELAC-project. Especially interesting are the fully online approaches, as these are pedagogically and "technically" the most difficult to run and design (in mixed mode approaches misunderstandings, questions etc. can be taken up in physical classes and "life" goes on even though the system may experience severe difficulties – a server breakdown would be more fatal to a fully online than a mixed mode course).

Another set of differences are the overall pedagogical approaches and it can be useful to highlight two different tensions: teacher vs. participant control, curriculum orientation vs. problem orientation. Graphically this can be represented as below:

	Curriculum Oriented	Problem Oriented
Participant controlled	Self-study, portfolio Study groups	Projects, case work, Field work, PBL, POPP
Teacher controlled	Lectures, courses, semi- nars, tests	Laboratory, experiments Problem solving, assign- ments, (PBL)

Figure 4. Different modes of pedagogy (Ryberg & Dirckinck-Holmfeld, 2006)

We do not mean to say that these approaches are mutually exclusive; on the contrary these different approaches are often mixed in practice, but the different dimensions/tensions can be more or less dominant in an overall pedagogical approach. PBL (Problem Based Learning) can be put in two different categories based on who defines and decides the problem to be worked with, whereas POPP (Problem Oriented Project Pedagogy) is situated within the field of problem orientation and participant control. For a brief introduction to the foundational principles in POPP and how it is implemented for example at Aalborg University (see deliverable 4.1 pp. 25).

The final aspect to mentioning regard learning approaches are the challenge of a dialogical approach. A dialogue based approach to learning is embedded in the POPP/PBL approach; however the dialogue based approach can also be seen as an approach in itself within learning and mixed mode learning (Sorensen, E., K., 1997). The dialogue based approach is inspired by an understanding of knowledge and learning as socially constructed through the use of language.

Virtual learning environments offer certain opportunities for dialogue based communication and shared meaning construction. Using forums for meta-reflections give the students an opportunity to reflect on their actions, furthermore forums can be used to present and discuss subject matters. Forums contribute to making the teaching and learning processes more flexible. The students – and professors – can continue the discussions in a written format in the forums, when formal classes have finished, or forums make it possible for students to communicate about shared problems. The textual nature of forums both contains strengths and weaknesses regarding teaching and learning. The written format forces and gives opportunities for the students to externalize their thinking, and the flexible format makes it possible for the students to communicate, when it's convenient. As we shall see in deliverable SP5 most partners designed for communication and dialogues, however in many cases the written dialogues also seem to be quite challenging. People found it hard to expose themselves in a semi-public space and the written language causes problems, especially if it's a second language. In some contexts (on-campus) written dialogues didn't make much sense as it was easier for the participants to meet physically. However, the projects also show that forums provide new channels for establishing dialogues, negotiating content at hand, and to meta-reflect on the learning process. In order to benefit from forums in VLE's the use of forums has to be an integrated part of the learning approach.

To frame the virtual learning approaches institutionally has been an important part of sub project 4. One of the means have been to run Future Workshops for rectors, senior managers and professors. These workshops have supported the Latin American partners to develop institutional strategies based on the integrative thinking of pedagogy, ICT and organisational needs and traditions.

For a fully account of the work on “learning approaches” please look into Deliverable 4.1 (Annex 2).

4.2. Application of ICT

The application of ICT in the ELAC project is thoroughly described in deliverable 4.2, 4.3& 4.4 and 4.5).

The component 4.2 within the ELAC project is concerned with the establishment of a virtual learning laboratory for the assessment of applicable concepts and tools. In considering the application of ICT and appropriate learning approaches it is important to consider both the pedagogical approaches and the tools that are already in existence and being used at the participating universities; as well as the experience of best practice as regards the implementation of these tools. Parallel to this are the aspects of flexibility in existing software tools and adaptability. It is essential that the Informations Management System/Learning Management System (IMS/LMS)-system that is taking into use foster the application of ICT in education in an effective way taking account of the needs and wishes of users (administrators, teachers and students). The IMS/LMS serves as a virtual communication- and collaboration tool among teachers, and among teachers, technicians and pedagogical designers in courses development – within the Latin American Universities, but also in collaboration between the European and the Latin American Universities. Further more, the IMS/LMS has been flexible in order to integrate potential students and teachers located in other provinces or departments than the main campus.

One of the tasks regard the application of ICT has to establish virtual learning laboratories (e-learning labs, e-centres, una-virtual) among the partners. A virtual learning lab is an organization that takes care of managing the on-line or mixed mode education that an educational institution offers. This means that it has several tasks, organizational, pedagogical and technical. It coordinates between traditional departments like the pedagogical curricular development, the technical support team and the management of the organization. Due to the ever changing nature of the ICT tools – changes both in software and hardware, it is necessary to take into consideration how to deal with this change. Moreover the changes effect not only technical actions, but have as well deep pedagogical and organisational consequences. A virtual learning lab should therefore be able to address integrated aspects of pedagogical, technological and organisational change.

The virtual learning laboratory has an important role in assisting teachers, professors, managers and students involved in online and mixed mode learning through training and support. However, the virtual learning lab also has to be in the forefront and proactively inspire for development in pedagogy and technology use. The virtual lab therefore should carry out research, along with experimental and developmental work in close collaboration with teachers, students and managers. The experimental infrastructure is an important aspect of the virtual learning laboratory, and also serves as the most important mean for developing online education and mixed mode learning environments. The ELAC project has been applying open source software with great succes. The LMS system Moodle has served as a shared platform – not only for the development of the courses – but also as the communication and collaboration tool for the ELAC project, and the ELAC management. Moodle has functioned very well, and is now integrated as the primary platform at all the Latin American Universities.

The use of open source software has turned out to be very interesting and helpful. Not having to think about licenses and how to get extra money every time you want to set up an experiment, or to invite new students and professors to participate support the development of an experimental culture. Seen from the perspective of the ELAC project an experimental culture can provide

teachers, students and managers firsthand experiences of online learning, which can be used when building up strategies for changing and transforming the universities to cope with the challenges of the future.

The ELAC project has moreover confirmed that experiments and projects have to be based in the culture and learning approaches of the participants. The European partners – through their engagement in online and mixed mode learning in two decades – have contributed with their experiences. Using collaborative methods in the projects, common conceptual frameworks for online learning was built. These conceptual frameworks moreover have been used to evaluate different VLE's, and to choose Moodle as a common platform.

Virtual learning laboratories are running at all the Latin American Universities and they are sustained beyond the ELAC project at the local university. The partners would like to expand to the national level, and make the experiences available nationally; moreover they would like to increase the international engagement, and finally to strengthen the research and experimental dimension in relation to the implementation of ICT for teaching, learning and research – in further collaboration with European partners.

The virtual learning laboratories have served as a very important means for course development – as well the training courses and workshops provided by the European partners and the pilot courses and training courses developed by the Latin American partners. The outcome has besides the approximate 20 training courses developed by the European partners been 2-3 pilot courses by each Latin American partners, a number of training courses, and the implementation of virtual learning elements in many of the ordinary on-campus courses. In deliverable 4.3 & 4.4 there is a presentation and description of all the training courses being held by the European partners, while the presentation and description of the pilot courses and other courses developed by the partners can be found in Deliverable 4.5.

The experiences from Sub Project 4 is further more under publications in *The International Journal of Education and Development using Information and Communication Technology* (IJEDICT) in a special issues on 'Problem Based Learning in developing context - Innovating Learning through ICT'. The editor for the special issues is Lone Dircinck-Holmfeld, and the special issue will have contributions from most of the ELAC-partners (see Annex 7). The special issues will be published in the spring 2007.

5. Assessment of Achievements and Major Constraints

Subproject 4 has achieved the objectives formulated in the Grant Application with very good results. The project has developed the capacity of IST-based teaching and learning among the Latin American partners; developed a number of pilot courses, which have proved the feasibility of virtual learning/mixed mode learning in contexts of limited access to computers and network, and build up a mechanism to deliver virtual, and mixed mode courses beyond the lifetime of ELAC. Moreover the project has developed from a pilot project run by single departments / groups to be situated in the core of the universities strategies for integrating IST for learning, administration and research. Most of the partners (both European and Latin American partners) have further more been engaged in national, regional and international project, and as so the project has impact far beyond the concrete pilot course development.

The challenges: cultural, pedagogical, technological, organisational have been dealt with in a systematic manner applying dialog- and action oriented approaches, and there have among all partners been made a huge effort to overcome eventual constraints. Especially, the context of Nicaragua have some timed coursed extra challenges in order to overcome for example power cut in electricity, and in the case of UNAN also some constraints related to organisational matters, for example in the beginning of the ELAC project to have the server running 24 hours per day. However, all these context specific constraints have been dealt with professionally. The major constraints - or challenge we could call it - is to establish a resource base to continue the development work, to anchor the experiences in research and to build up research capacity within the area of ICT and learning in a Latin American context. In order to support this and follow up on the experiences of ELAC, we have established *ElacVirtual*.

6. Future Perspectives

The Future of ELAC

By common agreement among its partners ELAC will, in the future, take the form of a non-profit-making association known as *ElacVirtual*, which will continue to offer training and promote the project once the @LIS programme comes to an end. To this end, two of the universities involved have been commissioned to carry out the groundwork needed to set up the association and to present a work plan that ensures the desired continuity is achieved.

At the last meeting of the project's Steering Committee, agreement was reached regarding the key features of the future work plan for ElacVirtual:

- 1) At the organizational level
 - a) Appointment of an executive committee responsible for the general coordination of all action carried out by ElacVirtual. This executive committee will comprise a representative from each of the eight universities involved in the original project. The committee will define the objectives and scope of the association.
 - b) Maintenance and improvement of the ElacVirtual website [www.elacvirtual.net]. The current site includes all the information needed to understand the work carried out during the project. However, it will be expanded in order to offer a kind of virtual learning environment based on the Moodle tool, as well as a forum for communication among members of the association.
- 2) Training and publication with an annual programme
 - c) Setting up of a summer school (or similar) aimed at academics and university managers from Central America. The aim of this initiative is to train academic managers from other universities in the importance of virtual learning, as well as in the ELAC model and its adaptations. This school will be run in some of the Central American countries that are ELAC members.
 - d) Organization of an international conference dealing with the consequences of the project and their theoretical and applied interest. The aim of the conference will be to inform the international scientific community about the work carried out. This action will also involve publication of a book or an e-publication.
 - e) Establishing the ELAC Prize. Aimed at secondary school pupils and university students in Central America the prize will be open to the public and will be awarded for the best digital educational materials on the subject of environmental education. These materials will be published and made freely available on the ElacVirtual website.

Sustainability

The sustainability of an initiative such as that presented here, as well as its ratification and possible expansion by the executive committee, resides in the fact that most of the actions proposed are self-financing. This must clearly be the case for one-off events, such as *c)* and *d)*, which may even provide the association with resources through funding being shared with various national scientific and technology agencies (which could make resources available for the organization of scientific conferences).

Other actions, such as *a)*, do not require special financial resources, while others, such as *b)*, would only need small amounts. However, action *e)* would require a fixed amount of funding equivalent to

the value of the prize. The universities themselves could no doubt make small contributions in this regard, as might the education ministries in some countries, and thus they would become co-financers. At all events, the prize should have more of a symbolic and prestige value than a financial one.

The other kind of sustainability concerns the involvement of participating universities. All of them have expressed an interest in forming part of an association of the kind mentioned above, and thus it seems highly likely that most or all of them will join forces in order to secure new sources of funding, whether from Europe or the Americas, thus helping to boost the results obtained within ELAC and transmit and extend them to other universities.

7. Conclusions

Based on the ELAC project with respect to sub project 4 we can make the following conclusion:

The *action research* approach seems to be very appropriate in projects like ELAC. Action research takes point of departure in the actions and dialogues among competent practitioners. Bringing the experiences and expertise of European and Latin American partners together have created a very rich learning environment for the development of pilot courses, and for preparing the Latin American and European universities for the 21 century. The ELAC project has provided a solid foundation for integrating ICT putting pedagogical reflections and learning in the foreground. In contrast to more traditional implementation projects which focus on building up the technical infrastructure, the ELAC project has made learning the centre for development and making pedagogical design, ICT and organisational change the supporting tools.

The development of pilot courses have given the universities a new portfolio of networked learning environments, however *as* important, the development of pilot courses have made it possible for the participants to acquire tangible experiences and learning through the development of their own courses. In that sense the development of pilot courses are embedded in a transformation strategy in which the partners get concrete experiences with the many different aspects of virtual learning; experiences which can be used for developing theories and strategies in a broader sense.

The ELAC project has shown that an open source learning management system as Moodle can be applied in many different ways depending on the local conditions and aims. The pilot studies support the view that each environment is unique and requires a specific design and realization. Given the situated uniqueness, the way a LMS or other ICT tools constrain and afford learning activities are not absolute; affordances and constraints must be considered in relation to the characteristics of the specific context, the needs, the motives, and abilities of the participants, and the kind of activities to be supported. In general, pedagogical designers, professors and students have been very satisfied with Moodle, the LMS used by all partners. Moodle has provided adequate tools and resources for teaching and learning, and the interface has been inviting and intuitive.

The overall approach in the ELAC project has been inspired by socio-cultural and socio-constructivist approaches in a broad sense, and there has been a massive interest in applying elements of problem oriented project pedagogy. The specific pedagogical designs have been pragmatic compromises – on one hand inspired by newer theories on learning, on the other hand to respond to what is practically realizable. However, what is very important is that the ELAC project has created an environment for continuous improvement and development of the learning environments. Developments which are incremental, but in the long run may lead to radical changes as professors, pedagogical designers and managers get more and more insights and experiences with ICT and learning.

The overall approach within SP 4 may be labelled a dialogical approach – both in the relation between partners and participants in the overall project approach, and in the pedagogical approaches applied in the pilot courses. New virtual means such as forums, chats, blogs, wikies etc. (so called web 2.0) support this approach in the day-to-day management of the project and in the development of courses. The ELAC project has been successful in taking up these news tools, which brings the course development in the ELAC project pedagogically and technologically in the forefront. The institutional backup further sustains the approaches and activities within each university, but has also contributed to the development of a national agenda on ICT and Learning as an integrated approach of pedagogical, technological and organisational change.

The overall conclusion is that the ELAC project has provided the Latin American partners with visions and tools for a solid integration of ICT into the university practice as well as ELAC has established a fertile ground for a development strategy based on the integration of pedagogy, technology and organisational changes and international cooperation.

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Annex 2 *Deliverable 4.1. Conceptual framework of the innovative teaching and learning methods (Available as a Separate Report)*

Annex 3 *Deliverable 4.2. Establishment of a virtual learning laboratory for the assessment of applicable concepts and tools (Available as a Separate Report)*

Annex 4 *Deliverable 4.3. & 4.4. Training and implementation plan (in Spanish) (Available as a Separate Report)*

Annex 5 *Deliverable 4.5 and 4.6. Pilot courses and workshops for educators (in Spanish) (Available as a Separate Report)*

Annex 6 *url for project website: www.elacvirtual.net (follow the link)*

Annex 7 *url for sub-project website: <http://www.ell.aau.dk/ELAC.59.0.html> (follow the link)*

Annex 1: List of Abbreviations

Partner Abbreviations

DTU	Technical University of Denmark
AAU	Aalborg University, (Denmark)
LU	Lancaster University, (United Kingdom)
UB	Universitat de Barcelona, (España)
UNA	Universidad National, (Costa Rica)
(CINPE-UNA)	(Centro Internacional De Politica Economica-UNA)
UCA	Universidad Centroamericana, (Nicaragua)
UNAN	Universidad Ncional Autónoma de Nicaragua nucleo Managua, (Nicaragua)
UAM	Universidad Autonoma Metropolitana, (Mexico)

Country Abbreviations

CR	Costa Rica
DK	Denmark
ES	España
MX	Mexico
NI	Nicaragua
UK	United Kingdom

Other Abbreviations

CSCL	Computer Supported Collaborative Learning
CEF	Continued Education Facility
CMS	Course Management System
ELAC	European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning (Title of this project)
GIS	Geographical Information System
ICT	Information and Communication Technology (TIC in Spanish)
IMS	Information Management System
LA	Learning Approaches
LA	Latin America
LFA	Logical Framework Approach
LMS	Learning Management System
MOM	Minutes of Meeting

Moodle	Modular Object-Oriented Dynamic Learning Environment (Course Management System (CMS) in Open Source applied in the ELAC project as both LMS and VCE)
PBL	Problem Based Learning
PMU	Project Management Unit
POPP	Problem Oriented Project Pedagogy
SP 1	Subproject 1: Continued Education facilities
SP 2	Subproject 2. Information Management System
SP 3	Subproject3. Content Development
SP 4	Subproject 4. Learning Approaches
SP 5	Subproject 5. Implementation of Courses
TOR's	Terms Of Reference
VCE	Virtual Collaboration Environment
VLE	Virtual Learning Environment
WSIS	World Summit for the Information Society