

# Evaluation and evolution of the eCourse Ecology in Architectural Design

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## ABSTRACT

Ecology in Architecture Design (EAD) is a project with the main aim of developing a blended (face to face lectures plus online activities) learning course about how to integrate ecology in the architectural design, both at the level of a single building and of territory. EAD started in July 2004 as a project founded by the Swiss University Conference within the Swiss Virtual Campus (SVC), the national program studying the introduction of information and communication technologies in universities and universities of applied sciences. EAD partners are Swiss universities, laboratories and technical schools with expertise in architecture, energy, ecology, technology, design and communication and its main target are students in architecture. After two years of development, due to the positive results achieved, EAD has been selected also to enter the maintenance phase ending in December 2007. EAD has been tested during academic year (a.y.) 2004-05 in Accademia di Architettura of Mendrisio, the project leader, and since then EAD has been used in Switzerland, Italy and Brazil. Results of the applications are very positive and encourage partners to improve contents and tools and to explore new uses and targets.

## 1. INTRODUCTION

The idea of the course started from the remark of a cultural and educational lack [1] [5]: often the relationship between environment and design is not well integrated in laboratories of architecture schools and not even in the processes and products of buildings and cities designers; EAD would represent a model to promote an advanced educational path for developing sustainable architectures.

The project is run by the Accademia di Architettura of Mendrisio, in association with the Centre Universitaire d'Etude des Problèmes de l'Energie (CUEPE) of the Université de Genève, the Hochschule für Technik und Architektur (HTA) of Fachhochschule Zentralschweiz (FHZ) of Luzern and the Institute for Applied Sustainability to the Built Environment of the Architecture, Construction and Design Department (DACD) of SUPSI of Lugano. The eLab (the eLearning laboratory of USI and SUPSI) guarantees assistance and technical support for educational and graphic design and technology [4] [5].

EAD main aim is to develop a blended learning course about how to integrate environmental themes in the architectural design and to transfer to the next generation of architects the skills to include these components in their professional activity; at the end of the course, students are able to follow an ecological approach in design, to understand the consequences of different

choices and to evaluate alternatives, in order to optimize the given project [1] [5].

Thanks to EAD, students experience innovative didactical tools [1] [4] [5] within the 12 modules ordered by two main sections (building and territory). The overall structure, the module organization and the components of a module are represented in table 1.

Acronyms	Section	Study of the relationship between:	Tools of each module
B_C	Building (B)	B and climate (C)	Presentation, readers (with studies in depth and external sources), tests, tasks, interviews, case studies, virtual tours...
B_A	Building (B)	B and air (A)	
B_W	Building (B)	B and water (W)	
B_G	Building (B)	B and ground (G)	
B_E	Building (B)	B and energy (E)	
B_P	Building (B)	B and population (P)	
T_C	Territory (T)	T and climate (C)	
T_A	Territory (T)	T and air (A)	
T_W	Territory (T)	T and water (W)	
T_G	Territory (T)	T and ground (G)	
T_E	Territory (T)	T and energy (E)	
T_P	Territory (T)	T and population (P)	

Table 1: EAD's structure, sections and modules

The structure has been remained the same since the beginning of the project, while didactical scenarios have been customized to each use. EAD structure allows a good flexibility in customizing didactical scenarios merging different modules and varying some "teacher-sensitive" elements as tasks, for example [1] [5].

## 2. DEVELOPMENT OF THE PROJECT

Main steps of EAD project are resumed in table 2.

Period	Activities	Results
July – Sept. 2004	Fast prototyping	Prototype module B_C
Oct. 2004 – Jan.	Test of the	Information for

2005	prototype	optimizing module's structure, graphics and tools
Oct. 2004 – Sept. 2005	Preparation of the modules	Materials and tools
Mar. – July 2005	Involment of other institutions	Feedbacks, suggestions, contributions, Dissemination
Aug. – Dec. 2005	Usage in Brasilia	Case studies, Feedbacks, translation
Dec. 2005	Monitoring	
Oct. 2005 – Jan. 2006	Usages in Mendrisio and Geneve	Feedbacks
Mar. – June 2006	Usage in Mendrisio	Feedbacks
June 2006	Partners consortium creation	Agreement with Milan
Dec. 2006	Monitoring	
Oct. 2005– June 2006 [END OF THE PROJECT]	Completion, translation, implementation and optimization of the modules	Materials and tools
May – June 2006 [END OF THE PROJECT]	Involment of other institutions	Feedbacks, suggestions, contributions, Dissemination
July	Selection of EAD by SVC	Founding for maintenance
Aug. – Dec. 2006	Usage in Brasilia	Feedbacks
Oct. 2006 – Jan. 2007	Usages in Mendrisio and Milan	Feedbacks and improvements
Mar. – June 2007	Usages in Mendrisio and Lugano	Feedbacks and improvements
June - Dec. 2007 [End of the Maintenance phase]	Realise, marketing, targets, usages	Strategies for maintaining the course

Table 2: main phases and results of the project

### 3. EAD DIDACTICAL APPLICATIONS

Different usages are reported in table 3. Before each use, it is very important to define the didactical scenario, that means to identify how to merge different tools and materials according to the teacher style, aims, the duration of the course, and students' needs etc. During the use, results have been registered by "assignments" and "assessments" records available on the platform [1] [4] [5] and, at the end of each use, a student evaluation of the experience has been done using a questionnaire.

In Mendrisio, an EAD-dedicated optional course has been created since a.y. 2005-6: Ecology Applied to the Project (EAP). In EAP, a direct integration of ex cathedra contents in atelier activities has been planned. Further, students have the possibility of integrating EAD with contents edited by their own, such as their laboratories projects (that could be uploaded as case studies); this aspect contributes to build a database of "best practices" for future students.

Furthermore, some EAD tools (software) were used in all projects created by the students not in an EAD-dedicated course, but in the framework of a laboratory called Ecology of the House, with the aims of integrating building's energy demand analysis and of giving a better understanding of links between energy demand and construction characteristics of buildings.

These and other occasional experiences omitted in this paper are important signals of several moments of communication among different teachers and students thanks to EAD introduction. Statistics demonstrate that almost the students enrolled actually use EAD's tools (fig. 1).

A.Y.	Course	University	Number of students	Modules
2004-5	Ex cathedra	Mendrisio	112	B_C
2005-6	Ex cathedra	Mendrisio	40	B_C B_E (B_P) (B_W) T_C T_E (T_P)

A.Y.	Course	University	Number of students	Modules
2006-7	Laboratory	Mendrisio	40	(T_W) B_C B_E
	Ex cathedra	Geneve	24	B_C B_E T_C T_E
	Ex cathedra	Brasilia*	12	B_C B_E
			Master 33	
			Bachelor	
	Ex cathedra	Mendrisio	26	B_C B_E B_P T_C T_E T_P
2007-8	Laboratory	Mendrisio	45	B_C B_E B_P T_C T_E T_P
	Mixed	Milano*	6	B_C B_E T_C T_E
	Mixed	Lugano	12-Arch. 3-Civil Eng.	B_C B_E B_A B_W
	Ex cathedra	Brasilia*	10	B_C B_E T_C T_E
	To be defined	Mendrisio Geneve Brasilia* Vaduz* Milano Lugano	To be defined	To be defined

Table 3: usages of EAD in the different universities (\*: institutions involved after the creation of the consortium of the partners)

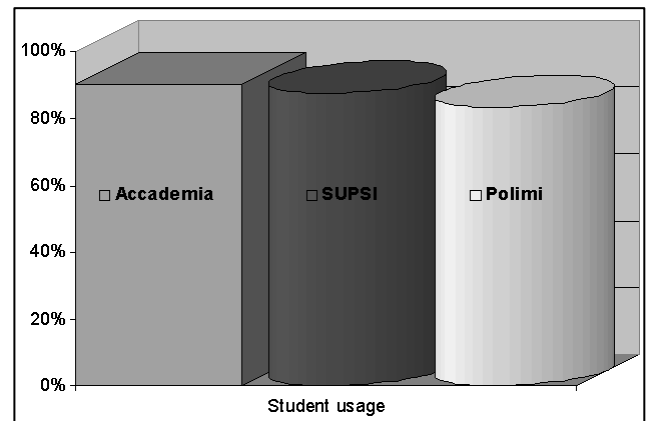


Figure 1: % of users (students that have used EAD/students able to use EAD) in the universities involved during the present a.y. (Accademia of Mendrisio; SUPSI of Lugano and Politecnico of Milan).

Looking at the experience within the course of “Ecology Applied to the Project” in Mendrisio, statistics demonstrate that the most important tools for students are the tasks, especially for B\_E and B\_C modules (fig. 2)

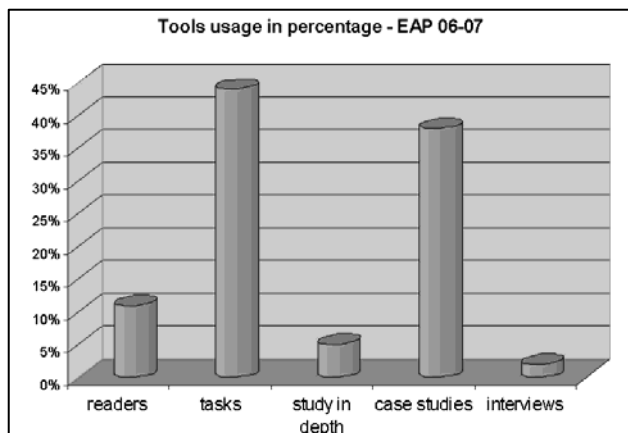


Figure 2: The most usable tools during the last experience in Mendrisio.

#### 4. EVALUATION; QUESTIONNAIRES RESULTS

The evaluation of the effectiveness of EAD has been evaluated also by the submission of questionnaires at the end of each usage [1] [4] [5]. In the following paragraphs, main results are resumed.

##### 4.1 Accademia of Mendrisio, 04-05

Overall, the course quality was judged quite positively, and the team is satisfied, considering that this was the first eLearning experience for most of the students and the first release of the course.

##### 4.2 Accademia of Mendrisio, 05-06

The second use of EAD in Mendrisio was with 40 4<sup>th</sup> and 5<sup>th</sup> year students: a general interest with good results for the first experience using the almost completed EAD platform (the entire palette of modules).

##### 4.3 Université de Genève, 05-06

The questionnaire regarded profile of the students, use of the course digital materials, communication, impact and evaluation. In general, students have been happy of the experience that was for many of them the first one in eLearning. Even if some problems have been noticed in regards to the language, because students are generally used to have tools in their mother tongue while modules were first developed in English, also this experience could be evaluated as profitable in term of know-how transfer.

##### 4.4 Universidade de Brasília, 05-06

EAD had a great impact and students were very interested and very well impressed with the high quality of the tools and contents, despite of some technical problems. It has to be underlined that learning conditions in Brazil are very different from Europe and Switzerland in terms of tools and resources availability, of teaching conditions and so on. Therefore, this synergy represents also a real attempt in the direction of cooperation and knowledge transfer.

##### 4.5 Mendrisio, Lugano, Milan 06-07

About 50 students from Lugano, Milan, Mendrisio had answered to the questionnaire, that contained questions about usability, quality of contents, and several other aspects of EAD platform. The overall results are represented in figure 3.

The evaluation about general aspects gives some useful results:

- a better integration of offline and online activities has been suggested and could be reach with a well planned didactical scenario
- a simpler navigation, helped by a clear set of instruction should be implemented; the new platform (moodle) could be suitable to that end
- graphics and multimedia should be improved giving a more attractive view.

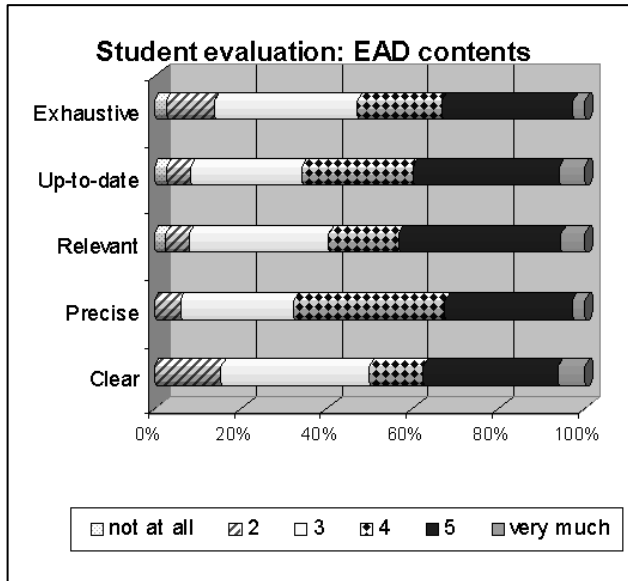


Figure 3: Evaluation of the experience in different usages in a.y. 2006-7.

There are differences in answers by students among different universities and age: in Lugano courses, the most part of users are students in architecture, but we have also students in engineering in further education courses, while in Mendrisio, Milan and all users are students in architecture.

The evaluation of contents done by students could be resumed in the following points:

- a general review of contents should be done, with the integration of new topics for updating EAD
- a review carried out both by students and experts could be useful for improving the didactical exposition of different topics.

The original aim of EAD has been confirmed also by open answers in questionnaires: the interest of young students in architecture about the application of ecological aspects of their future work is ever growing.

## 5. NEW PLATFORM

During the last year, some features were changed: all tools were migrated from WebCT Vista to Moodle platform; a new show and new navigation mode have been implemented. The new hypertext model has become simpler not

only for users (students), but also for editing and adding materials such as studies in depth, interviews and other resources (teachers and assistants).

The new fully modular structure achievable in the new platform permits a better and faster creation of courses merging of the “old” modules in a new structure called “map”.

At the moment, all modules are available in English, while some are available also in Italian, French, German and Portuguese (tab. 4); in the next future, other modules will be translated in Italian (the most used mother tongue) and tested.

Modules	English	Italian	German	French	Portuguese
B_A	X	X	X		
B_C	X	X			X
B_E	X	X		X	
B_W	X	X			
B_P	X				
B_G	X	X	X		
T_A	X	X	X		
T_C	X	X			
T_E	X	X		X	
T_W	X				
T_P	X				
T_G	X		X		

Table 4: Modules of EAD available in the different languages

## 6. MAINTENANCE AND DEVELOPMENTS

Due to the positive results obtained during usages and monitoring meetings, at the end of the duration of the project, EAD receive further founding from SVC for carrying out improvements. The maintenance phase started in July 2006 and will finish at the end of December 2007.

During this phase, a complete review of images, case studies and interviews is previewed; further, virtual tours in relevant buildings and blocks will be implemented for a more appealing and interactive comprehension of different themes. Furthermore, a review of

contents is on the run and will be completed by experts not involved in the original creation of EAD.

Partners are also involved in the elaboration of a protocol for defining the destiny of EAD after the end of the maintenance.

We can aspect that in the next future EAD will be used especially in the Italian part of Switzerland and also in the North of Italy both at different levels of the academic curriculum and by professional workers.

The platform could work also as shared repository of projects elaborated by students, making available a broad collection of tools, promoting exchanges among teachers, students, tutors and external experts and developing a cooperative approach in problem solving during project design. In the case of Milan, the development of a more project-oriented approach could be implemented: the structure of EAD could be customized on the basis of the design process, using the contents and tools more for understanding how to start and elaborate “ex novo” the project of a building or of a town, than for verifying and for evaluating it.

About next usages, we can expect that in Accademia di Mendrisio EAD will be applied in master courses by creating a new map about “post lauream” course of sustainable architecture. Also in SUPSI of Lugano and Politecnico of Milan further applications are under discussion. Further, we can expect also a usage in Hochschule Liechtenstein of Vaduz.

## 7. CONCLUSION

EAD represents not only a successful experience of integration of ecological issues in courses of architecture and of ex cathedra knowledge in design activities, but also a very effective instrument for the creation of a common didactical platform in the same academic institution and among different academic institutions. Because the possibilities of improving, updating, customizing and sharing materials and tools are very wide, further applications and developments will

follow, with domino effect caused by number of institutions and number of students or workers involved.

Starting from the idea that teachers have an important responsibility in transfer scientific ecological consciousness to students in architecture (next architects), we hope that our efforts will be useful for developing a new, more environmentally conscious, generation of architects, endowed with the necessary tools for the comprehension of the environmental effects of their projects, for improving energy performance of their buildings, for planning and managing cities with a real sustainable approach. Results obtained by questionnaires, statistics and students works seem to confirm the effectiveness of this new didactical approach. It could be very interesting to find collaborations for comparing EAD with other similar tools and experiences.

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