

Faculty training as a key factor for Web Enhanced Learning sustainability

Draft of:

Trentin G. & Alvino S. (2011). Faculty training as a key factor for Web Enhanced Learning sustainability. In M. Repetto & G. Trentin (Eds), *Faculty Training for Web-Enhanced Learning*, ch. 1 (pp. 1-19). Nova Science Publishers Inc., Hauppauge, NY, USA.

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ABSTRACT

What are the conditions which favour web enhanced learning (WEL) sustainability in the academic environment? How is it possible to act so that these conditions are fulfilled? To what extent does the pedagogical training of teachers affect WEL sustainability? How is it possible to train teachers to use WEL effectively? These are the main questions which this chapter aims to answer.

To this end, we will begin by describing a possible multidimensional model for WEL sustainability.

Then we will focus on the two dimensions which are retained to be fundamental for high-quality WEL: the pedagogical dimension and the dimension of professional growth of faculty members as concerns WEL design methods. In this regard, an examples will be given of a specific faculty training approach centred on progressive construction by the teacher him/herself of a personal instructional design (ID) mental model.

INTRODUCTION

One of the parameters used to measure the sustainability of an innovation is the number of those who adopt it permanently and can therefore contribute to guaranteeing a sort of self-maintenance (Bass, 1969). What can be said in this respect with regard to the educational use of ICT?

After the initial hype, fostered also by the technological boost induced by the new economy, there is now a growing awareness of the exaggerated expectations that were placed, for instance, on e-learning in the past (Trentin, 2007a). Furthermore, the main financiers (often public) have gradually become increasingly wary of distributing resources and have dwindled and, sometimes, even withdrawn their support to initiatives centred on e-learning. In many cases this has led to a sort of backlash, a trend reversal in attitudes of those who potentially could have benefited and could benefit from it (each individual and/or institution).

In other words, instead of following the classical S-curve (dotted line in Figure 1), typical of the trend of every successful innovative process over time (Bass, 1969), the path of those who use e-learning would seem destined to follow a similar trend to the one indicated by the continuous line in Figure 1 (Rogers, 1995).

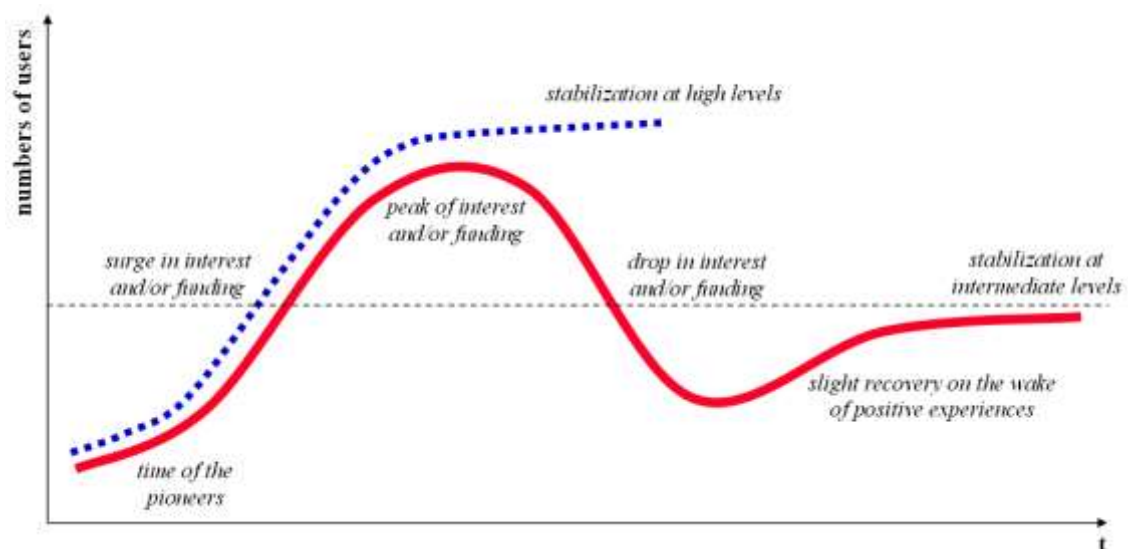


Figure 1 – Trend of innovation processes over time

This is a trend that has already been observed in the past for other processes related to the introduction of new methods in education, for example distance education (DE). High expectations and large investments resulted in a boom in the use of corresponding technologies. However, once the initial hype had subsided and the funds, particularly, had come to an end, there was then ultimately the decline. This may be attributed to cultural aspects (the potential user is not ready to adopt these methods) and organizational aspects (the contexts are not ready to be able to provide the necessary structure for a systematic use of DE) as well as disarming experiences often due to a

lack of professionalism and sloppiness on the part of who, when proposing new teaching strategies, aimed above all at cutting the training costs.

In some cases actually, there was a slight recovery (shown by a sort of rebound in the diagram of Figure 1), especially corresponding to specific projects aimed at the introduction of DE methods, projects based on investment in human, cultural, organizational and technological resources i.e. an investment towards systemic quality.

Nevertheless there are and have been too few successful initiatives of this kind and even less diffusion towards new potential users. Consequently there is a sort of asymptotic convergence towards median values shown in Figure 1 (Trentin, 2007a).

The same trend may be observed in e-learning even though the pervasiveness of ICT at various times of our daily life (work, home, etc) could play a decisive role in accustoming people to consider its use also in the educational and/or continuous training processes. It would therefore be reasonable to assume that the educational use of network technology still has enormous penetration margins on both an individual and institutional level, although one cannot disregard engaging in a deep reflection on the conditions required to fully use its potential in order to enhance the teaching/learning processes (Bates, 2002).

At this point it is fair to ask ourselves: What actions should be undertaken to ensure that such practices take permanent root and become diffused? Can WEL establish itself as an integral part of educational practices or will it keep its connotation of being extraneous to the system, with the risk of sooner or later ending up in the very same dusty storage area with other educational technologies which had promised so much in the past in terms of teaching innovation? Besides the quality and professionalism of the staff, what other elements come into play to achieve real WEL sustainability especially in view of the increasing lack of ad hoc funding?

THE KEY ISSUES

In the WEL field two problematic situations still need to be addressed:

- the various experiences of using the web in education have not led to significant changes in the management of educational activities at the institutional level, and it has so far been mainly anchored to funded projects and/or on pilot or even personal actions;

- many WEL projects which have been started with great enthusiasm and on a solid qualitative basis have been abandoned as soon as their funding has run out.

Fundamentally, rarely are the right conditions created for the full incorporation of WEL approaches into teaching practice, in terms of teaching methodology innovation and positive feedback based on sustained costs and tangible and intangible returns on investment.

This would seem to imply that, without public or private sponsors, those same methods and technologies are unable to achieve self-sustainability, despite the fact that they have often demonstrated their validity from the point of view of educational effectiveness.

Hence the fundamental question: is WEL just a flash in the pan that will be replaced by the next trends in technology, teaching and pedagogy which are related to the educational use of ICT? Or does it actually have the potential to become a springboard for learning/teaching processes?

If we analyse the current situation according to the criteria indicated by Rogers (1995) for the diffusion of innovation (advantages, compatibility, complexity, trialability and observability), the resulting outlook is far from encouraging. From surveys conducted on significant samples of the potential user, it would in fact seem that (Seufert, 2003; Seufert & Euler, 2003):

- the advantages of adopting WEL are relative and the benefits deriving from it are still not clear (apart from the hope of cutting costs);
- there is great difficulty in integrating WEL approaches into the higher education structure (organisational, technological, cultural, etc.);
- WEL is still perceived as a complex methodology to manage and its experimentations have provided little reassurance in this regard;
- WEL is not considered as providing the same educational quality as traditional methods;
- it is hard for an institution to completely understand what WEL is, what this new way of perceiving educational processes entails, and what possible benefits can derive from its use.

That is why in recent years experts in the area have initiated a lively, complex debate on what factors may be for and what factors against WEL sustainability.

One of the most controversial points is to understand on what basis a WEL-centred educational project can be considered a success from the sustainability point of view.

A POSSIBLE REFERENCE MODEL FOR WEL SUSTAINABILITY

So far though the use of WEL techniques has found fertile ground mainly among those who, after careful reflection on precisely how to innovate and improve teaching, have acquired them, beyond any formal commitment, as a standard educational approach or at least as one of the possible approaches.

The key is therefore to identify the most effective way to spread this attitude, in order to encourage the change from occasional use of WEL to its formal integration into the practices of higher education.

Discussing the stabilisation stage of an innovative process, Euler and Wilbers (2002) write:

“... if a foreign body is getting implemented in a system, either it adapts and will not be regarded as alien or it will continuously be identified as a foreign body and be eventually rejected from the system.”

In fact, the more sustainable an innovation process is, the more it has those features for integrating itself effectively and efficiently into the reference institutional context. Thus, sustainability may be considered the measurement of the success of an innovation process.

From these considerations, and drawing on some specific sector studies (Seufert e Euler, 2003; Attwell, 2005; Trentin, 2007b), we have derived and herewith describe a possible reference paradigm for WEL sustainability, as an aid to understanding the problems connected to it.

The model overview

If we analyse the elements which can potentially affect WEL sustainability, they can be placed in a space of at least 8 closely-interrelated dimensions (Figure 2), each referring to a specific disciplinary domain.



Figure 2 – The eight-dimensional model for WEL sustainability

The following is a detailed examination of each of the eight dimensions of the model proposed in this chapter (Trentin, 2007a).

The Economical Dimension – This comprises all the aspects related to the optimisation of the resources at hand, ranging from the costs of development and practice to those for subsequent reinvestment. The economic aspects have always been considered one of the key elements in favour of WEL sustainability. However, it is known that to guarantee appreciable quality in WEL, the economic elements should not be put before those more specifically related to its pedagogical dimension. It has now been shown that whenever this happens, the choice of pedagogical approach is generally conditioned and channelled towards a WEL based primarily on the individual (and passive) study of educational materials. Despite usually being considered cheaper, content-driven approaches almost always curb the quality of the learning process, since they deprive it of its other important key dimension: social interaction (Trentin, 2010).

The Pedagogical Dimension – It concerns the added value and the pedagogical potentialities introduced by media use in order to promote WEL sustainability with regard to the quality of the teaching/learning processes. Moreover this includes the possibility of using specific functionalities of the technological platforms to improve the monitoring process of the learner's state of progression during most of the learning course, so as to achieve a summative and formative assessment (Bloom, 1971; William & Black, 1996; Trentin, 2009).

The Professional Dimension – This regards identifying the key figures needed for the design, development, delivery and management of WEL, as well as training methods for them. The professional dimension also includes issues concerned with the formal recognition and appreciation of these figures, as well as strategies for a generalised cultural growth of faculty members in WEL use.

The Informal Dimension – This concerns those processes that help individuals to meet their cognitive demands through the autonomous use of e-content and, above all, participation in networked interaction within online communities, aimed at sharing knowledge and good practices. This dimension therefore implies a WEL that is not so much based on a specific 'formal' educational event, such as a course, than on the individual ability to find, through a sound use of ICT, what may be required to resolve a problematic situation, to meet a specific info-cognitive demand, and so on.

The Organizational Dimension – This refers to creating the organisational conditions (adaptation and development of structures and processes) for actually integrating WEL methodologies into the standard practices of higher education, in order to 'institutionalize' them. A WEL initiative conceived as an isolated project – i.e. not integrated into the institution and where maintenance cannot be guaranteed – has the remotest chance of surviving in the long run. Hence the need for an adequate organisational development within the reference context.

The Content Dimension – This regards both the quality of the transmitted content and its implementation into e-content; also the aspects related to its transportability, reusability and adaptability to contexts which may even be different from the original one for which they were created. This dimension is strongly correlated to at least three

other dimensions of the model: the pedagogical, technological and economical dimensions.

The Technological Dimension – This is concerned with aspects related to the functionality and stability of a technological infrastructure which should be capable of adapting to the requirements of both the context and the individual user. This dimension very often meets with difficulties regarding WEL sustainability, in particular when investments in hardware/software resources are over-estimated. In these cases, the result is that technology over-absorbs those resources intended for other purposes such as human resource development (especially hiring of faculty members). It is not unusual even nowadays to note how the technological aspects are over-emphasised, at both the organisational/institutional and the individual project levels, often to the detriment of the pedagogical dimension.

The Socio-Cultural Dimension – This refers to the socio-cultural changes required for a wide diffusion of WEL approaches. From this point of view, the key idea seems to be that of sensitizing individuals to self-management of the learning process, also as an effect brought about both by a culture that considers WEL as an integral part of working practice, and an ever-greater need for life-long learning.

While all these dimensions are important, two of them in particular play a key role for quality WEL sustainability: a) the pedagogical dimension and b) the professional dimension with specific reference to the faculty training processes. These are two closely-related dimensions, since the former aims at defining the theoretical/methodological principles underlying quality WEL and the latter at defining the operational principles for diffusing the knowledge and skills necessary for the effective application of said theories and methodologies.

THE PEDAGOGICAL DIMENSION

It has been mentioned that the pedagogical sustainability of WEL is closely related to the added value and to the new possibilities that the educational use of ICT can offer teaching/learning processes. One imagines, for example, using more stimulating and interactive study resources (simulation environments, adaptive computer-based tests,

intelligent tutoring systems, pedagogical agents, etc.); new forms of interaction and cooperation (also at a distance) among the participants to the same course; different ways of relating to teachers/tutors during individual and/or collaborative study; the use of integrated multimedia learning environments; and so on.

In view of these possibilities, it is therefore worth reflecting on how sustainable the extensive use of teaching/learning processes is pedagogically, fully knowing how it sometimes even implies radical changes in teaching, be it pedagogical or organizational, especially if compared with more traditional approaches.

Hence, the pedagogical sustainability of WEL is developed through a clear understanding of the various ways of intending and proposing the educational use of the Web and on how these can bring about important changes and/or improvements in the teaching/learning process. In other words: how can WEL really make the difference?

It recurrently emerges from international debate on this issue (Attwell, 2005) which predominant characteristics are considered necessary for a pedagogical sustainability of WEL. In short, the use of web-technology should face some critical educational issues (Rusten, 2003) and foster:

- *learner-centred processes* – implying that teachers take on a new role, namely that of facilitating the students in playing an active part in their own learning process, by formulating questions, experimenting, collaborating and developing new knowledge and understanding;
- *individualised instruction* – differences in individual knowledge and in styles and pace of learning are not usually catered for in a traditional classroom. As a result, students often demonstrate low retention rates of what is said and done in the classroom. Besides having a negative influence on their performance, this produces a habit of mechanical rote learning and consequently a lack of enthusiasm towards studying. Current learning models show that individualised, project-based instruction can reverse these negative effects and contribute to greater student and teacher satisfaction and motivation;
- *higher-order cognitive skills* – new curricula and new teaching practices are needed to enable students to develop and refine critical thinking skills;
- *learning processes based on reflection and creativity* – in education there is the need to create learning environments which enable students to acquire and use

information that helps them understand their world, so that they can in turn generate/acquire new knowledge;

- *active inquiry, research, and analysis* - students must learn to formulate critical questions, to identify, acquire, and organize information from different sources, and to analyze and make judgments about collected information;
- *learning processes based on social interaction and collaborative, artefact/project-based development* - students must be enabled to study and work cooperatively in groups, on projects and across the different disciplines, constructing new knowledge by means of a variety of both electronic and printing resources, working just as we do when tackling real-world and work problems;
- *lifelong learning processes* - learning takes place before, during, and after any formal education, beyond the classroom and through a variety of means (Cross, 2006). Thus, the sustainability of WEL will also be evaluated in terms of (a) the learner's education in the individual use of these resources and services and (b) in his/her capacity to become autonomous in providing for his/her own continuous training, once the 'formal' learning process has been completed, or if the scaffolding provided by the professional community he/she belongs to were to disappear;
- learning relevant to the professional/real world – education must provide information, knowledge, experiences and skills that are relevant to the everyday world in which students live and work;
- technological literacy - digital technologies have now penetrated most work environments. So the lack of technical literacy and skills, already at the learning process stage, is a serious handicap for the modern economy.

After this preamble, we shall now seek to outline a framework for analysing the pedagogical sustainability of WEL. The basis of this framework is the three key elements introduced in Figure 3 below; in other words, the ability of the teacher to know how to:

- choose the most effective WEL approach for the declared learning goal and the learning activities for achieving said goal;

- apply the key elements common to the various instructional design (ID) approaches;
- apply the most suitable assessment strategies for the declared learning goals and for the chosen WEL approach and technologies.



Figure 3 – The three key elements of the proposed framework for WEL pedagogical sustainability

Educational approaches – This element focuses on the added value and pedagogical potential deriving from the vast range of available WEL approaches.

In this sense it is fundamental for teachers to be familiar with the particular features of each approach so as to be able to choose them in compliance with the specific learning goals they wish students to achieve through WEL.

These approaches can be placed on a continuum that stretches from learning processes based on *individual study* to those centred on group interaction (*collaborative learning*) (fig 4) (Trentin, 2010).

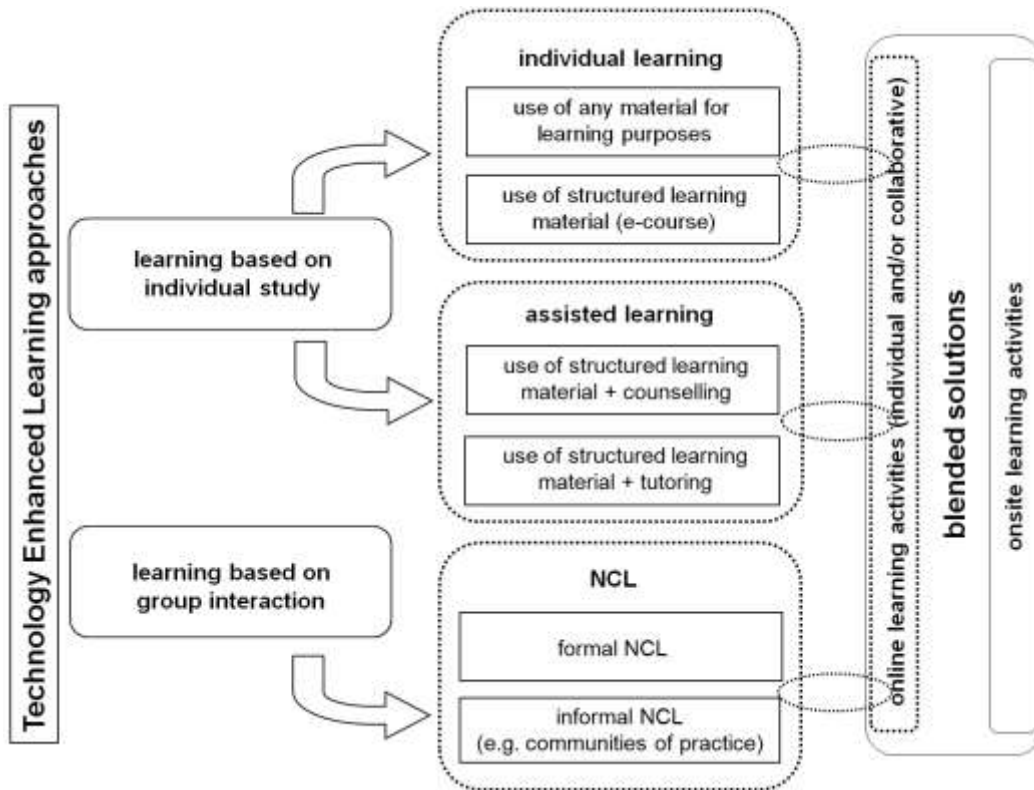


Figure 4 – A possible taxonomy of WEL approaches

Individual learning – this refers to individual use of material not necessarily produced for learning and of educational contents explicitly designed for individual study, such as standalone and networked educational software, as well as material produced for Open and Distance Learning (ODL).

Assisted learning – this covers individual study conducted by means of structured learning paths that can be implemented in two different ways:

- with some degree of support (even minimal) from the course provider, such as guidance from a tutor in using the material;
- assistance in subject material use from teachers/tutors who may also act as moderators in online workshops/seminars.

Networked collaborative learning (NCL) – The previous two cases largely concern content-driven learning, in that it is the materials that guide learners towards the stated educational objectives. By contrast, NCL regards educational processes based on the integration of individual study and collaborative learning (Trentin, 2010).

Blended solution (or mixed approach) – Although ‘blended solution’ actually regards the integration of different educational methods and tools, it is commonly seen as alternation between onsite and online teaching/learning activities, where the latter are not merely optional but an integral part of a course (MacDonald, 2008; Stacey & Gerbic, 2009).

Although knowledge of the various WEL approaches is the first fundamental step towards WEL diffusion in higher education, we must not neglect another important condition that influences pedagogical sustainability: the adoption of effective approaches to the design, running and evaluation of WEL, which by extension includes suitable training of those involved in these processes.

The instructional design approaches – Clearly, the design of WEL activities cannot draw on the same criteria as adopted for face-to-face courses. There is an evident need for methods that take into account and exploit the dynamics that make computer-mediated communication (CMC) unique. So, specific approaches to instructional design are required which support those intending to adopt WEL approaches in their courses.

In this sense it is interesting to note that some authors (Hense et al., 2001; Trentin, 2010), in discussing the question of teacher training in the basic elements of instructional design, suggest that this could provide the opportunity for a broader analysis of the general problems related to education and learning. The same authors rather aptly compare the adoption of WEL approaches to a sort of ‘Trojan horse’ that, while stimulating research into how to use ICT effectively to benefit teaching/learning processes, also leads to a more general reflection on those same processes, and on the way to innovate and improve them. Thus, WEL may have the potential to play a role in establishing a new culture which favours and supports the learning processes.

The evaluation and assessment approaches – One of the most critical aspects in WEL is the difficulty of evaluating (a) individual learning and (b) the learner’s participation in and contribution to group activities when a collaborative learning strategy is adopted. Consequently, there is a clear need to understand what approaches can be used for

formative and summative evaluation. This includes making use of the specific functions that online platforms offer for more accurate monitoring of learners' progress through the course (MacDonald, 2004).

This is a particularly delicate aspect, and it is thus important that the assessment activity be well-planned, clearly defining key elements such as (a) the purpose of the assessment, (b) the methods and means for performing it, and (c) the method for analysing the results obtained. These criteria must already be considered at the planning stage of the educational intervention (Rowntree, 1994), in order to guarantee that in the carrying out of the educational activity, the above-mentioned platform functions can be used to achieve the specific goals which have been stated for assessment.

THE PROFESSIONAL DIMENSION AND THE ENHANCEMENT OF TEACHER'S COMPETENCES IN E-PEDAGOGY

One of the keys to WEL sustainability is the investment of human resources in design, development, delivery and management. The introduction of Web-technology in teaching/learning processes entails adopting specific educational approaches that differ from those normally adopted in "chalk and talk" teaching.

In addition, WEL incorporates elements from both the educational/pedagogical and the technological domains and thus calls for special professional competencies. These concern design and implementation not only of e-content, but also collaborative learning activities (Paulson, 2002; Williams, 2003), such as the so called "e-tivities" (Salmon, 2002). In this sense, WEL sustainability in higher education also relies on the professionalism of faculty members and on access to suitable ongoing methodological training (Fullan, 2005).

But if it is true that WEL sustainability is underpinned by the professionalism of teaching staff, then that professionalism needs not only to be developed but also to be formally recognised at institutional level. This means redefining and negotiating new faculty roles introduced by the adoption of WEL.

Both teacher training and professional recognition fall within the broader area of the ongoing cultural development of everyone involved in the educational fields, from those at management level to those playing a technical role.

WEL involves a myriad of different roles, but in this chapter we will concentrate specifically on that of the teacher, whose involvement in online interaction is central, especially in the case of networked collaborative learning.

From teacher to e-teacher

We have seen that the faculty continues to play a key role in WEL, albeit one that differs significantly from that played in the classroom or lecture hall. Instead of simply lecturing, the teacher becomes a facilitator who fosters learning of the domain contents in which he/she is an expert by contributing to the development of e-content and supervising online e-tivities.

Hereafter, the term "e-teaching" will be used to identify the function the teacher performs when managing network-based learning activities. This function can be performed for the duration of an online course (pure online learning) or as part of online activities integrated into a course run face-to-face (blended learning).

Although this function is of strategic importance, the knowledge and competencies required for performing it do not appear to be so widespread at the academic level (Robinson & Latchem, 2003). So, given the broad range of strategies that the teacher can adopt to support learning processes, WEL sustainability clearly relies on adequate professional training of faculty members. In this way, the conditions can be established for more widespread, high-quality online learning.

This training also needs to respond to the emergence of the so-called "digital native" generation (Culligan, 2003) and their new ways of using communication technologies (Web 2.0, mobile technology), something which is also bound to influence their demands/expectations regarding the way they are taught.

The teacher's changing role

WEL calls on teachers and learners alike to assume different roles from the ones they are accustomed to playing in classroom learning. It is in this sense that Elliot (2008) propose the development of an e-pedagogy that requires a radical rethink of traditional teaching practices.

Teachers who intend to adopt network-based learning in their practice therefore need to understand fully the philosophy underpinning WEL and the paradigm shift it involves. Traditional teaching/learning practices are focused on the teacher, whose objective is to transfer a given body of knowledge directly to learners. By contrast, WEL concentrates on the relationships among learners, and on that between the learners and the knowledge to be acquired. Students are helped to be more autonomous, proactive and responsible towards their own learning processes.

Reiterating then, systematic uptake of e-pedagogy is conditional on faculty having access to suitable professional training so that they become capable of making autonomous and informed decisions about what WEL strategies will prove most effective for meeting the needs at hand. Moreover, teachers need to learn how to select the most appropriate interaction/communication strategies for the medium they have adopted. This is a particularly critical competency for teachers; acquiring it should help dispel any impression they may have that WEL simply means transferring onto the web the contents and teaching approaches that have proved effective in the classroom. In short, the special characteristics of a given medium mean that it is never neutral in terms of communication dynamics and strategies (Trentin, 2010).

FACULTY TRAINING ON INSTRUCTIONAL DESIGN

From the above considerations it appears clear that one of the most critical aspects linked to the diffusion of WEL approaches is teachers' acquisition of at least the basic skills of instructional design (ID).

In fact, university teachers are essentially experts in a given disciplinary/content domain and they often lack pedagogical skills and know-how. What can be realistically asked of them is to (Zeminsky & Massy, 2004):

1. make available their knowledge on a specific content domain, together with the methods to teach them;
2. invest a reasonable amount of time in acquiring elementary instructional design skills;
3. acquire familiarity with the typical dynamics of an educational process based on online interaction, and with the methods for conducting it.

In this perspective, a number of faculty training projects on the basic ID concepts have been set up in Italy since the '90s, to foster the effective integration of WEL methods into university teaching.

Some of these projects, particularly those organised by the universities of Turin (Trentin, 2006), Milan (Klobas & Renzi, 2003) and Genoa (see the WEL project described in chapter xxxx) have led to the working out of specifically-targeted approaches for helping teachers build a personal instructional design (ID) mental model.

HOW SUPPORT FACULTY TO BUILD A PERSONAL ID MENTAL MODEL

Providing novices and unskilled faculty with examples of best practices, reusable learning materials and lesson plans is a fundamental step towards enriching their expertise. Unfortunately, this step is often not sufficient to foster the integration of these heuristics into everyday practice. In fact, teachers often do not know for instance how to integrate Learning Objects (LOs) and reusable lesson plans into the learning experiences they are designing. Whereas expert designers tackle educational design problems on the basis of a well-known and shared set of principles and heuristics that form their mental model (Silber, 2007), novices or unskilled teachers who have not yet developed the same mental structure cannot act likewise, unless supported by a scaffold. Thus, initially they need to refer to a simplified and structured model in order to approach the design problem.

Teacher training in the field of ID should take these premises into account. Teachers should be fostered to build a personal ID mental model by providing them with a scaffolding that progressively fades out once the mental model is more structured. This should be a “multidimensional” scaffolding characterized by:

- *basic general ID models*, which provide a clear structure for the main steps and decisions of an ID process, especially in the field of networked collaborative learning (NCL);
- *reusable educational resources and models*, such as LOs and CSCL scripts, that teachers can retrieve on the Web and reuse to design individual or collaborative activities or entire courses;

- *heuristics and best practices* concerning (a) how to progressively introduce recursivity into the basic general ID models and (b) how to integrate reusable resources into an ID process.

According to this approach, teachers should primarily build their own ID mental model on *a clear structure of the main steps of an ID process*. To this end, traditional models such as ADDIE¹ (Clark, 1995) turn out to be very useful, since they can be considered as phase models of problem-solving, which try to represent what an expert designer knows schematically, procedurally, and in an outlined form (Jonassen, 2008). Although we could identify at least 13 versions of the ADDIE model, each of them is characterized by a “cascade” sequence of design steps and by the fact that the output of each design phase is the input of the following one. Using these models as a reference in ID teacher training could help to clearly outline the main elements, constraints and decisions which characterize each phase and which are necessary to develop the subsequent steps. In addition, the teacher or the designer has to take some decisions on a number of fundamental topics, such as (Alvino et al., 2009):

- definition of the aims of the learning process and structuring of the learning objectives;
- definition and structuring of the learning content;
- definition of the learning strategies and techniques (and possible reuse of schema-level CSCL² scripts, such as pedagogical design patterns³);
- definition of the learning activities (and possible reuse of instance-level CSCL scripts, such as lesson plans) and of the learning groups (in terms of number, dimension and composition).
- definition of the required learning resources: identification of already-available resources, development of new ones, reuse of LOs retrieved on the Web;
- definition of monitoring and evaluation aims, criteria and indicators;
- definition of course schedule and other detailed design elements;
- identification of the communication needs and of the interaction channels and rules;

¹. ADDIE is an acronym deriving from the main phases of the model itself: Analysis, Design, Development, Implementation, Evaluation

². Computer Supported Collaborative Learning

³. See <http://www.pedagogicalpattern.org>

- definition and structuring of tools and areas characterizing the systems and tools supporting WEL processes.

When an expert designer tackles ID as a problem-solving process, he/she normally does not analyse these topics exactly in this order; firstly he/she focuses on some decisions and then refines the design through an iterative and recursive process. This can be done because expert designers are well aware of the reciprocal conditioning of the different design elements. Thus the “cascade” structure could provide a first fundamental scaffold for novices, since it acts as an “ordinate checklist” which reminds them of the fundamental steps they should not neglect.

Once this basic structure has been embedded in unskilled teachers’ mental ID model, they could be provided with heuristics and best practices about how to introduce recursivity into the linear-cascade model, progressively approaching a problem-solving perspective.

A first step could be to identify a *two-layered design process* characterized by a *macro-design phase* and a *micro-design phase* (Trentin, 2010). The linear-cascade model is split into two main partially-overlapping ID phases (see Fig. 5). In the “macro” phase, aims, objectives, contents, learning strategies and evaluation criteria are generally defined and outlined. In the following “micro” phase there is an iterative process of revision and/or integration of what has been defined in the macro-design; each decisional topic being reviewed and defined in greater detail; subsequently, learning techniques, activities, groups and resources are defined, together with the characteristics of the monitoring process, the schedule, etc. Parallel to the two-layered process, interaction and communication issues are tackled and technological decisions taken.

This model has revealed its effectiveness in a number of faculty courses and teacher training curricula (Klobas & Renzi, 2003; Trentin, 2006; Repetto, chapter).

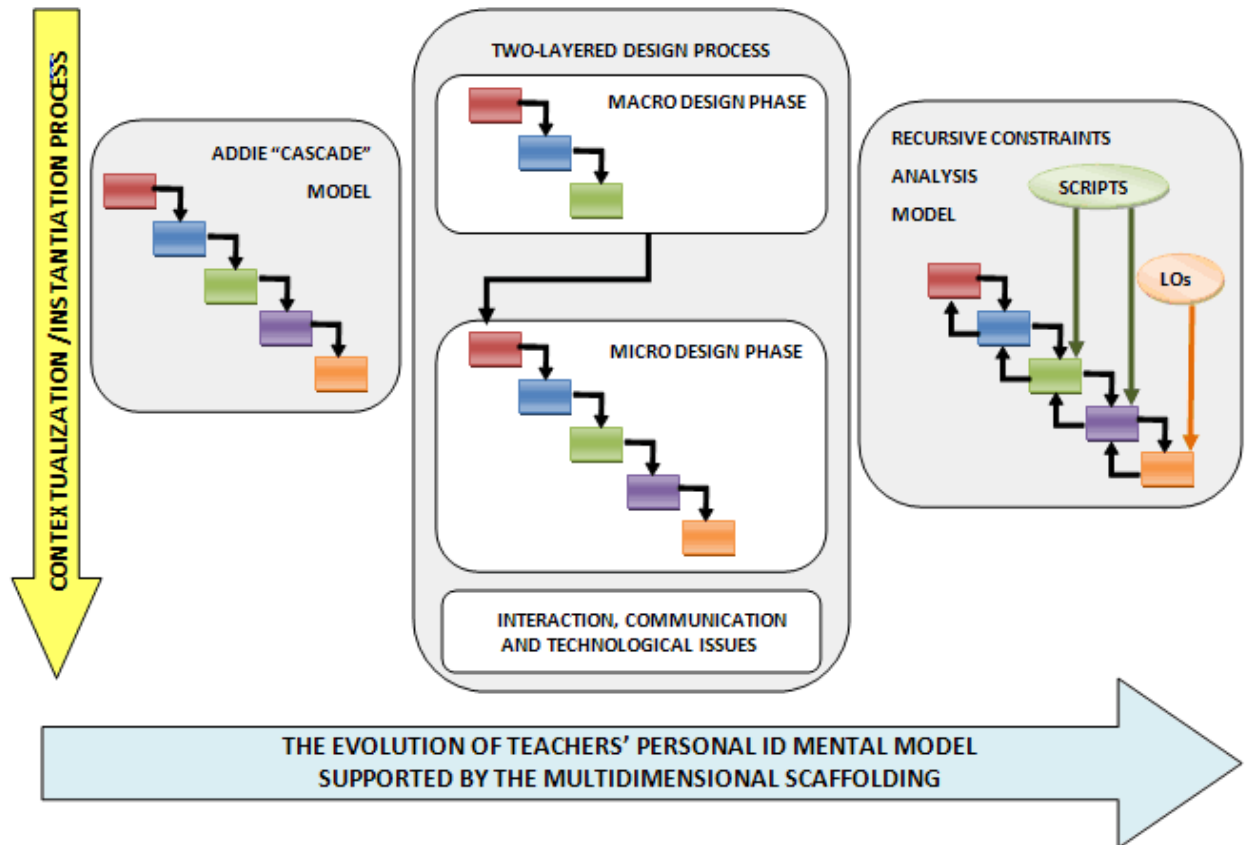


Fig. 5 – A comparison of three ID models: the ADDIE model, the two-layered design model and the *Recursive Constraints Analysis* model

Once they are skilled in managing this two-layered ID process, teachers could try to carry out more iterative processes of revision. To this end, they should be provided with further rules and heuristics to effectively manage the constraints which characterize the ID, especially when a collaborative learning is adopted.

In fact, in a collaborative learning process we can identify three main types of constraint (Alvino et al., 2009): 1) *initial*, i.e. technical, financial and contextual constraints characterizing the specific learning context; 2) *structural*, i.e. constraints deriving from choices and decisions taken during the design process which condition posterior choices (i.e. objectives, contents, etc.); 3) *heuristic*, i.e. constraints related to the application of the heuristics and good practices for effectively structuring the learning community, organizing collaborative activities and modelling the learning environment. According to the *Recursive Constraints Analysis model* (Alvino, 2008), each decision taken during the ID process and concerning the above mentioned topics: (a) should take into account the initial, structural and heuristic constraints introduced

before that step and (b) might introduce new structural and heuristic constraints which will condition subsequent choices. If previous structural and heuristic constraints conflict with the new decisions, some changes could be introduced into the design without modifying the general framework. In this way, to obtain a coherent instructional design, *teachers need to assume a permanent attitude of iterative review* (see Fig. 5). These rules are especially true when teachers want to integrate LOs and CSCL scripts into the ID process. In fact, these resources are normally characterized by structural and heuristic constraints which have to be taken into account when integrating them into a specific ID process. As stressed before, LOs and CSCL scripts can be integrated at different steps of the ID process, when defining learning strategies, techniques, activities and materials. For instance teachers should be aware that specific collaborative activities require specific tools (such as forum, wiki, etc.) and specific group configurations, or *social structures*, in terms of number, dimension, composition and participants' tasks (Alvino et al., 2009).

All the heuristics and good practices characterizing the scaffolding described above should be supplied to teachers gradually, so they can be integrated step-by-step into their mental ID model.

This approach requires the faculty trainer to manage direct and indirect support and to propose theory and practice in a flexible way, gradually introducing elements of complexity and variability and progressively fading out the scaffolding. To provide the described multidimensional scaffolding, faculty trainers should be expert instructional designers who master the main heuristics and best practices for the design of WEL processes, as well as the know-how to use the main resources, models and tools which could support unskilled teachers in the design process. In addition, WEL approaches should be learnt firsthand, so faculty training should include active and collaborative online activities, such as case study, problem-solving, learning-by-designing, etc. Setting up effective faculty training courses therefore requires particular attention both in choosing the teaching staff, and in defining the learning and communication management tools.

CONCLUSIONS

Although in the last fifteen years there has been a gradual increase in WEL projects, there are actually very few cases where they have brought about significant changes in terms of stability and quality. This is rather puzzling given that expectations about educational use of the Web were being hyped on the wave of the more general diffusion of state-of-the-art technology.

It is a common opinion that one of the most obvious reasons for this “lull” (especially in the Mediterranean area) is the persistent lack of culture in the use of Web technology as a routine educational practice which would meet the need not only for reduced training costs, but also for new improved processes in teaching. This inadequate culture is reflected (particularly within the university) in the current lack of adequate regulations which could enhance innovation, attributing equal dignity to network-based and traditional face-to-face education.

Consequently, to date the sustainable implementation of Web-supported teaching/learning processes still remains an open question. This is why experts in the area have begun a lively, complex debate as to what factors may be for and what factors against WEL sustainability.

However there appear to be a certain points of agreement among these experts; in order to be sustainable, WEL should:

- first of all offer real added value to education by introducing interactivity and simulated environments;
- by organizing students into learning communities, foster collaborative study and mutual support, which can act as a backing for a new culture of WEL use in informal learning processes (based precisely on active participation in online professional communities) (Cross, 2006);
- propose a use of the technology which is able to effectively support specific teaching methodologies for specific disciplinary contexts; considering case studies in the medical field, role-plays in the managerial sector and so on;
- foster development of teaching materials so that they are easily reusable in different situations, thus cutting the time and costs required for creating them;
- take initiatives aimed specifically at WEL sustainability, i.e. initiatives for creating (on both institutional and individual user levels) the necessary cultural, professional

and infrastructural conditions for the frequent use of WEL approaches in managing entire courses, as well as for integrating it into the more traditional classroom teaching.

In an attempt to contribute usefully to the ongoing debate, this chapter has outlined a possible model for WEL sustainability. The model highlights the complex relations among the dimensions characterizing it, which mean that in analyzing one of these dimensions it is unthinkable to ignore the influence it may have on the others. Nevertheless, in the light of what has been said above, the possibility of analysing each of these dimensions separately may indeed be useful for the critical evaluation of WEL sustainability.

In the chapter the two dimensions retained to be most crucial for quality WEL sustainability are particularly analysed: a) the pedagogical dimension and b) the professional dimension, with specific reference to the faculty training in WEL approaches and their design.

Regarding the latter aspect, the experiences gained in specific Italian projects on faculty training have led to the working out of an approach which is specifically targeted at supporting teachers in the construction of a personal ID mental model.

As has been emphasised at several points in this chapter, this passage is retained to be essential for the effective integration of WEL practices into university teaching.

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