European Distance and E-Learning Network (EDEN) Conference Proceedings

EDEN FIFTH OPEN CLASSROOM CONFERENCE

Teachers' Professional Development

addressing eLearning, Innovation and Quality in Schooling

Conference Book

CNED-Éifad
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on behalf of the European Distance and E-Learning Network

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Introduction

Having started a new strand in its activities in 1995, with focus on distance education, open and flexible learning and the ICT as regards school level education, EDEN has been organising the Open Classroom Conferences since that year, with the support of the Open Classroom Working Group and in collaboration with the European Experts Network for Education and Technology (EENet) since 2003. Previous Open Classroom events - conferences and workshops - have reflected upon the vision of schools communicating through networks as well as with various content and application service providers, in the cyberspace, while validating open, distance & e-learning practices. An important aspect of the activities has been the transfer of ideas from more well-established ("traditional") application areas of ODL to the school sector.

The Fifth Open Classroom Conference, in October 2005 in Poitiers, addressed the ever-increasing needs of Teachers Professional Development, in search for Innovation and Quality in School Education, as these needs are imposed by the emerging e-learning paradigms, the search for new, more effective school structures and the broader challenges that societies are facing in their way towards what has been identified as the Knowledge Economy.

During the last decade, certain developments and the pervasive impact of the Information & Communication Technologies on school education have taken place and closely followed-up, through a number of initiatives, projects and policy actions, engaging relevant actors and stakeholders in Europe (schools, universities and education authorities, training bodies and technology providers). At the same time, social evolutions – namely social mobility, migration, internationalization, multi-culture societal structures etc. –, have already changed the mandate which School Education is up to. There is an increasing demand for a radical upgrade of quality, in order to meet the needs for new competences and skills. Towards this *Quest for Quality*, the already critical role of the *Teacher* as well as of other education professions is being significantly upgraded, in terms of both the new competences and skills required and the emerging professional perspectives and tasks in the school environment. Transforming the school education system to an open (e-)learning environment in the lifelong learning perspective means significant amendments to the existing teacher profiles as well as the elaboration of new professions (and education tasks) that are necessary in order to sustain quality in a national or regional school system.

The EU has already adopted a set of policy orientations, under the Education & Training 2010 Programme of actions, in the framework of the Lisbon Process, while most Member States are striving through resisting structures and hindering factors, in order to introduce innovation and well-defined changes, having the teacher at the (epi-)center.

The Fifth Open Classroom Conference contributed to the social, political and research dialogue, for the development of sustainable collaborative Teachers Training & Professional Development Models for Schools in the Knowledge Society. These models address the new complexities, in terms of (e-learning) processes, new competences, contexts and resources in school education, fostering new roles for learners, teachers, experts and policy makers, scientific, academic and cultural entities.

EDEN acknowledges with thanks the most valuable support of the host institution, CNED. The organisation of the conference at the French distance learning flagship institution in its modern campus at Futuroscope, in Poitiers, aimed at carrying a dynamic message while offering an excellent environment for the professional community, striving through turbulent times for school education.

Dr Nikitas Kastis
Chair of the EDEN Open Classroom Working Group

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Lena Dafgård, Learn@ccess, Sweden

Background – a short description of the development of distance learning[1] – from the 18th century to where we are today

The development of distance learning has been a process in several stages. It started with the first generation of distance education in the form of courses by mail as early as in the beginning of the 18th century. With the possibilities of modern technology, the second generation of distance education was developed using media as radio, television and computers. The third stage of e-learning emphasizes two-way communication and the use of electronic mail-systems and databases. The introduction of the Internet, which led to the fourth generation of distance learning is so far the most significant stage of development with advantages of rapidity in communication, better possibilities for collaboration between students, unlimited sources of information, easy accessibility etc. With further development of the fourth generation of distance education to the fifth generation, "The Intelligent Flexible Model" emerged where teachers and students get in contact with the institution through a portal and automatic intelligent solutions for support are used, e.g. for frequently asked questions.

When looking back and analyzing what has been the driving force in these different stages of development of distance learning, it is obvious that since the second generation the most important reason for development has to do with technology in some way. New technology has made it possible to communicate in new ways and that is the main reason why different generations of distance education have developed. One of the crucial problems with distance learning is that unlike the classroom situation when teacher and students spend a lot of time together at the same time, teacher and students actually spend most of their time separated and they still have about the same need for communication. Since new technology has created opportunities for development of e-learning it is natural that a lot of time, money and energy have been spent on technology, but now it is high time to start emphasizing on pedagogical perspectives, to put the student in centre and make use of the technological possibilities in order to give all distance students equal possibilities to be successful in their studies.

Distance learning – on equal conditions?

In my work with further education for distance teachers, I have more and more started to reflect over the fact that students' different learning styles are provided for, more or less automatically, in "traditional" classroom education, while text based information and written communication are the dominating elements in distance education. How does this affect students' conditions in distance learning? Are conditions equal in distance courses for students with different learning strategies and preferences – both when it comes to learning subject matter and studying course content? Can students' different learning strategies and preferences make it harder for some students and easier for others? Is it possible that focus on written communication, which is very common in distance courses, can involve difficulties for certain students at not only one but at several stages of the learning process?

[1] I have chosen to use the different terms "distance education", "distance learning" and "e-learning" alternately without making any difference between them.

Differences in communication

What are the reasons for these differences in ways of communication in the classroom situation and in e-learning? One explanation why text based communication is most common in distance education is probably that it is the easiest way to communicate at a distance and it also has the advantages of being independent in time in most situations. It solves the problem of bridging over the distance between teachers and students and between students. Another explanation might also be that the text based communication is an inheritance from the earliest forms of distance education, the correspondence courses and that it is sometimes difficult to leave those traditions behind.

The learning process

The learning process is a very complicated process and it often involves going back one or several steps to an earlier stage before moving forward again. There are important differences between individuals and there are many different theories about how we learn. It is impossible to get deeper into the subject in this short paper and therefore I am only going to bring up a few aspects which are directly linked to the difficulties some students may experience with too much emphasize on written material and written communication.

For example, Carl Holmberg describes two important elements in teaching. One element is to make information accessible to the student and the other element is to give the student possibilities to process the information, the learning process. When analysing the learning process broadly, for some students the first difficulty might be found already at the first stage– the stage when the student obtains information and studies the course content – if the main part of the course material is in writing without support of e.g. lectures or seminars. To study a course with this type of organization, the students should be able to read texts without difficulties and easily acquire knowledge in written form. What makes it even harder in a distance learning situation, is that this process mainly proceeds with the student by himself with less natural possibilities to discuss questions and obscurities with fellow students during coffee brakes etc. To be successful, the student needs the prerequisite which fits this pedagogical organization.

What I have chosen to call the second stage in the learning process deals with processing the course content, to create cognitive structures and acquire a deeper understanding and knowledge. This process can be particularly difficult for some students if the main part of this process is focused on writing. When students have difficulties to express themselves in writing and find it difficult to convey their message, these difficulties can also affect the process of reflection and analyse and therefore also the possibilities to learn. These students need oral discussions together with others to attain an equal result as other students can reach by processing the material in writing. However, it is important to remember that at the same time the focus on written form can also be an advantage for those students who prefer expressing themselves in writing.

Eva Rydberg Fåhræus describes in her doctor's thesis, "A Triple Helix of Learning Process. How to cultivate learning, communication and collaboration among learners.", how three groups of learning processes are developed and interact. These three groups of learning processes are:

- of content
- of communication
- of collaboration.

Together they form the spiralling model of a "Triple Helix". The two first groups of learning processes – content and communication – are maybe the most interesting for the importance of providing for different learning styles in distance education but also the third item – collaboration – is of interest. Rydberg Fåhræus' conclusion is that even distance students need interaction to be successful in their studies, give additionally support to the idea that we need to reflect much more over what media we use for interaction and how we use them when organizing distance learning.

Learning strategies

Learning strategies is a very complex field and it is impossible to cover in this short paper. I will only discuss a few major issues in connection with distance education. Everybody can learn. Each individual learns in his/her way – has an individual learning strategy. Learning strategies involves weak and strong points. It is easier to learn using the strong points than the weak points. Learning strategies involves differences in environments, social factors, media and time of the day (and night). Some students prefer studying in an

- environment which is
  - formal or informal (sitting at a desk/laying on the sofa)
  - dark or light
  - quiet or noisy.

Some students prefer certain

- social factors and wants to study
  - alone
  - in group
  - with the teacher.

Some students prefer learning through

- different media
  - reading
  - illustrations, pictures, diagrams, overhead transparencies
  - non-visual learners
  - combination of listening and reading.

Students acquire new information in different ways. Listening is for many students the hardest way of learning new complicated information, particularly facts. Some students learn by reading. Many students learn better with support of drawings, pictures, photos, diagrams and other illustrations than they do with only printed letters. Some students are partly or not at all visual learners. Even though they can read the words, they do not remember what they mean. A combination of listening and reading works very well for those who prefer learning by multimedia as television programs, films and other video material. On the other hand, there are also learners who get distracted when a combination of picture and sound is used. These students find it difficult to concentrate on more than one stimulus at a time. Some students are kinaesthetic learners which means that they learn best when they take part in activities, move, experiment and experience. Many students find it easier to learn when they get information from several channels, e.g. speech in combination with text and pictures.

Different learning strategies can also involve differences points of time. When students try to learn, e.g. in the morning when they actually are more receptive in the afternoons, they have to work harder to achieve the same goal.

In distance education, the student has greater possibilities than in face-to-face education to adjust the environment and the time to what he or she prefers since self studies is a major part of distance education. The flexibility in time and room is very high in e-learning and that is one of the advantages with distance courses. Since different students have different preferences concerning social factors, it is important that the organization of the distance course involves not only individual work but also group work and that there are frequent contacts with the teacher, so that the student feels the teacher's presence in the course. The use of the Internet in e-learning has made it much easier to collaborate in groups at a distance, both with asynchronous communication using different kinds of forums etc. and with the help of tools for synchronous communication where you can hear, talk and see each other in

a situation which is similar to a physical face-to-face meeting, e.g. using Netmeeting[2], Interwise ECP[3] or Learnlinc[4].

Interaction

There are several types of interaction in a learning situation and they are all important for the learning process.

There is interaction between

- the student and the course content
- the students
- the student and teacher.

Interaction with course content

In order to help students with different learning strategies it is important to give students possibilities to interact with the course content in different ways – to be able to study the material in different ways – e.g. by reading, by watching a video sequence with complementary pictures and other illustrations, listen to a sound file or combining several of these different media. Depending on the situation this may also be seen as an interaction between student and teacher.

Another way of e.g. helping students, who have some difficulties in learning from written material, is to use symbols for different kinds of activities in the study guide. Every time there is a reading activity, there is a symbol for that, when there is a writing activity there is another symbol, when there is group work there is a symbol which represents group work etc. (see example below):

 reading activity  writing activity  group work activity

Interaction between students

Today it is very common with group work in distance courses and since the interaction between students is very important to the learning process as described earlier, this is a development in the right direction. The problem is that most distance students have chosen to take a distance course, because they need the flexibility in time and room and they are not particularly fond of the idea of group work which involves physical meetings. One solution to this problem is that most of these group activities are in written form, e.g. one student writes a paper and sends it in for comments to other students. They write back and give comments in writing. This way of working has the advantage of flexibility both in time and room but has the disadvantage of emphasize on written communication.

Another way of co-operating at a distance is to use chats, which is a form of written conversation, taking place in real time (synchronous communication). This way of collaborating is sometimes very frustrating, at least for some students. There is often a difference in how fast students write and some students find it difficult to express themselves in this kind of situation. Chats can be extremely time consuming and many students get irritated because they experience the communication to be too slow and that it takes much more time than to have the same kind of meeting when you can use at least speech and maybe also video. It can also involve difficulties for students who find it difficult to express themselves in writing, particularly when they do not have time enough to reflect on their answers.

[2] http://www.microsoft.com/windows/NetMeeting/default.ASP

[3] http://www.interwise.com/live/index.asp

[4] http://www.ilinc.com/products_learnlinc.php

Interaction between student and teacher

Even though there can be more difficult to have physical meetings between teacher and students in an e-learning course, there are many technical solutions today, which can create a classroom situation at a distance. To combine self-studies and group work with lessons or seminars at a distance, are positive for the students' motivation and also helps students who have different learning strategies.

As an example, Sara Dahlström brings up the fact that different types of interaction can effect on what kind of learning is emphasized - surface learning or deep learning. Dahlström also writes in the article "The paradoxes of distance education"[5] that cognitive interaction is the sort of interaction that supports deep learning. She claims that is not only the students' ability to communicate in writing that is tried in distance education but in the highest degree also the teachers' skills in written communication. According to Dahlström, research considers that teachers who are going to teach distance courses have a considerable need for training in giving written responses. This is undoubtedly true but in my point of view it is equally important to broaden distance teachers' pedagogical perspective and make them reflect over if written communication always is the best solution and make them consider using other media for interaction. According to my opinion, it is necessary to try to develop new methods of teaching and to find new ways of communication as a complement to written communication.

In the technical perspective, there are no problems. There are plenty of technical solutions which make it possible to create a situation which in most parts resembles the classroom situation with speech and sound by Internet, streamed video, simulations etc. It is above all a matter of using technology in a pedagogical way and developing possibilities. It is true that there might be certain losses in flexibility in time, because other ways of communication than written communication often are examples of synchronous communication, but the benefits that can be obtained from the perspectives of equity and quality when using these media can probably often compensate for that.

A sixth generation of e-learning

If a sixth generation of distance education is to be developed, with emphasize on using different kinds of media in order to adapt the organization of e-learning to students' different learning strategies and to focus on students' different needs, than a prerequisite to accomplish this is of course further education for distance teachers both in pedagogy, methodology, knowledge about students' learning strategies and how to use technology in a pedagogical frame work. A development to a sixth generation of e-learning which I hope for is impossible without demand for further education of teachers. A prerequisite for this development is that teachers start to see technology as natural tools in teaching and that they are interested in knowing what can be done with help of technology and how to use it in a pedagogical context. So far, there has been too much emphasizing on technology for its own sake, both in research and in practical use. Now it is high time that we learn how to use technology for pedagogical purposes and analyse and reflect over what we really do when making decisions on using one media or another in an e-learning situation. It is time to develop a sixth generation of e-learning!

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CULTURAL VARIATIONS IN CONCEPTIONS OF PEDAGOGY AND THEIR INFLUENCE ON LEVELS OF TRANSNATIONAL E-LEARNING

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Abstract

The adoption of integrated e-Learning approaches currently advocated by education ministries across Europe has encouraged educators from all sectors to re-examine the delivery of the curriculum through radical reconstruction of the learning environment. This article examines intercultural teaching and learning from a UK perspective which arises from engaging in collaborative activities with partners in specialist technology secondary schools and colleges across several European countries. It also addresses the pedagogical processes and approaches used and developed in an effort to create a collaborative online teaching and learning programme and researches the extent to which transnational cooperation may be fostered.

Introduction

The expansion and implementation of new technologies in industry and commerce and their subsequent impact on the general global economy have created the need for educational institutions to adapt to changes in teachers' professional practice at a pace more akin to revolutionary, than evolutionary. Increased expectations in the marketplace to expand and adapt to new technologies have impacted on schools to revise their practice and educational provision, engaging a new pedagogy relevant to the 21st century. Technology and particularly the Internet have the power to transform education, posing a real challenge to schools and colleges on how best to integrate information, communication and technology (ICT) systems in order to progress and enhance teaching and learning. Awbrey, (1996) argues that through technology, educators need to encourage the workforce of tomorrow to develop the skills of abstraction, critical thinking, experimentation and collaboration. Bell *et al*., (2001) develops this perspective in his claim that exposure to the new technologies provides improvement to levels of technical competence, communication skills and the employability of those who engage with technology, whilst Richardson, (2001) comments that failing to adapt to technological change is simply denial of the future.

Traditional practices and teaching methodologies in the UK have for the past decade been the subject of inquiry, resulting in several reforms to both the school curriculum and the Standards set by the Teacher Training Agency (TTA) needed to acquire Qualified Teacher Status (QTS). One of the synoptic key issues – to embrace and integrate Information, Communication Technology (ICT) effectively across the curriculum has had a major impact on educational policy in all sectors of education, driven largely by governmental directives and national initiatives to establish a core ICT-based curriculum as the fundamental aim. In an attempt to hasten this action, the inception of several web-based educational-linked organisations has been instrumental in the creation of a network of e-learning communities. The British Educational Communications and Technology Agency (Becta), the government's key partner in the strategic development and delivery of its ICT and e-learning strategy for schools and the National Grid for Learning (NGFL), both provide online teaching and learning resources which disseminate information and inform subscribers of new developments in ICT and multimedia. However, one of the main developments of such like educational web sites would appear to be their capacity for inter-connectivity between individual and groups of students and their educational institutions within the global dimension. Standards are becoming increasingly international in scope and as user levels continue to rise, the exponential potential of the Internet in education cannot be underestimated.

The propulsion of change currently being applied to educational policy in the UK is underpinned by the objective to raise standards of attainment in schools in parallel with technological advancement. In response to this action, the Department for Education and Science (DfES) has developed several initiatives, one of which is to award individual secondary schools *technology status* according to each school's fulfilment of a set criteria. Thus, enabling the establishment of technology schools and colleges nationwide, whose main aim, to demonstrate excellence in teaching and learning through an integrated ICT approach, is characterised by the implementation of a technology-based curriculum.

The outcome has resulted in an enormous impact on the professional practice of educators, the response of which has been widely diverse according to the individual's qualification, technological experience and level of confidence necessary in making the requisite change to their practice. Collectively this is indeed not an uncommon reaction. Institutions react to change in different ways and they adopt them at different rates (Rogers, 1995). These outcomes are further affected by the additional expectations of the institution in its changing ethos and code of practice to place specific demands on the individual to adapt and to operate within the desired educational framework. Many tutors have little experience or expertise in online learning. Those tutors who feel comfortable working with technology in online environments are rare and there is generally little transference of skills to their colleagues (Oliver and Herrington, 2002). Driven by the continual revision of and modification to education systems and approaches, the situation has arisen for educators to have to rethink the constitution of the learning environment to meet the needs of a rapidly changing technological society. The direct consequence has been for schools to renegotiate the curriculum based on new and innovative teaching methodologies which fully embrace ICT, notwithstanding the individual tutor's resistance to change for the aforementioned reasons.

Transnational e-Learning Project

Socrates is the primary action programme which actively promotes the information society to all group communities in Europe. The European Commission thus strongly supports the inclusion of a European dimension in education and training in order to bring more equal access to educational opportunities throughout an enlarging Europe. Open and distance online activities have become a part of mainstream education in all sectors (Steel, 1993). There is also a greater emphasis on cooperation and collaboration brought about by information and communication technologies provided by direct and remoter access throughout Europe (Reding, 2000). Revised policy, which now places greater importance on collaborative learning to encompass the new technologies, has enabled schools throughout the UK to develop partnership links with their feeder schools and institutions of higher education in an effort to address cooperation through the development of new and innovative learning programmes using new technologies. Working parameters have been further extended across Europe to include the new European nations. Through the Socrates-Minerva Action, the European Commission supports the development of new technologies in education and aims to support innovative practice in European education through the development and implementation of Open and Distance Learning (ODL) and ICT across the curriculum.

The Edurobot Project (2003-2005) was facilitated by seven national coordinators across Europe, involving groups of students and teachers from twenty five technology status schools and colleges. Its aims were to develop students' knowledge and understanding of robotic science and to examine the impact of ICT and ODL models on the organisation of teaching and on the learning process through participation in a virtual learning environment (VLE). It also set out to consider the effectiveness of *networking* through cooperation and the exchange of ideas and experience connected with ODL and the use of ICT in education.

Participating schools and colleges included students with different prior knowledge, age, social and cultural background and ways of thinking and reacting to understanding and learning. Each demonstrated different levels of technology competence according to their different stages along the e-learning continuum. In addition, to add to the complexity, were factors of a less tangible nature in which students' approach to the task of learning differed, together with adopted attitudes and patterns of behaviour developed over time.

The UK schools' involvement comprised three secondary schools taken from across England. For purposes of reliability in the evaluation of the project, schools with different foundations were invited to participate; a large co-educational comprehensive technology school, a purpose-built technology college and a girls' grammar school, pending technology status. Schools and colleges agreed that collaboration and cooperation should be facilitated through the VLE framework to include diagnostic tests, online mentoring, video conferencing and virtual discussion rooms. The expectation of the project was for schools to interact with the didactic modules designed by the platform provider and to engage with the technology in order to produce online teaching and learning materials. In response to this, tutors were given the brief to create modules comprising several individual units of study relating to a particular curriculum discipline.

e-Learning, e-Pedagogy

Indicators for the successful implementation of e-learning environments such as Interactive Learning Systems (ILSs) and Virtual Learning Environments (VLEs), are primarily determined by the incorporation of certain design principles and qualities such as the active engagement of learners. High levels of interaction are dependent on purposeful active engagement facilitated through the quality of support mechanisms to aid and help students find their way into and through complex online interactive e-Learning systems. Mayer, (2001) introduces the concept of *Instructional Design*, which he maintains is not only concerned with delivering information, but also with the way in which information is presented enabling the individual to engage in appropriate cognitive processing and so promote effective learning. In support of this, Barker, (2005) claims:

"the fundamental prerequisite for the development of all eLearning systems is the design of an appropriate organisational framework for the underlying knowledge corpus that forms the basis for the learning system."

Thus, 'appropriate' in this particular case may be judged according to the compatibility of such systems within the cultural and educational context, together with student levels of technical competence and interaction. By its very definition, to 'engage effectively' with computer technology requires *interactivity* and the ability of the user to 'navigate an eKnowledge corpus' (Barker, 1998). Knowledge acquisition is therefore an interactive process that demands students possess the necessary skills, which are not only compatible and relevant, but also competitive to the present day tasks he/she is required to perform when interacting with different e-learning systems and across different types of e-learning communities. It would appear that there is still much to be done to improve the design, as these principles and qualities are not as well adapted or fully utilised as they might be (Cairncross and Mannion, 2001). The challenge regarding individual and collaborative online interaction is essentially based on the ability to accommodate both the exhibited styles of the organisational framework and the personalised styles of the learner in order to create a balanced and effective system; one which addresses the needs of the student within his/her educational and cultural environment. Additionally, in the creation of a new multimedia resource, the process of identifying and meeting the needs of the training, together with structuring the necessary pedagogic and design framework is complex and time-consuming and benefits from multidisciplinary teamwork (Dillon *et al.,* 1998). Indeed, the process develops further structural complexity once the European dimension of working in collaboration is added, placing further demands on educational institutions to respond to and implement the necessary strategies and operational schemes in their aim to foster cooperative transnational learning.

> 'The success of international online learning relies on educators being able to create virtual learning communities that facilitate meaningful interaction in culturally diverse discourses.'
>
> (Walsh, 1999)

It is also worth noting that the challenges arising from encounters with cultural difference may actually be intensified by the use of ICT. The project highlighted such cultural difference and demonstrated that the effectiveness of online learning is dependent on the design and infrastructure of the VLE, together with the compatibility of the institutional teaching and learning styles within the

national, cultural and historical context. It could therefore be suggested that education systems and their teaching methodologies are intrinsically embedded in and time and space and take form according to an evolutionary process characterised by the traditions and behaviour of a particular society. This means that the norms and values of those societies will also vary, leading to distinct styles in education to support them. Clearly, the format, the accessibility and ease of navigation through the system of an international e-learning platform are critical factors in the design process and the sensibilities of designers to have insight and understanding of the integrated approaches according to a multi-cultural application are essential.

Project e-Valuation

Feedback provided by partners in the evaluation process highlighted several issues. One such issue was the schools' ability to engage effectively with the design format and tools of the online modules within the domain of their individual cultural and educational framework. It was noted that levels of engagement with the technology were largely determined by the existing organisational structures of each school to support learning through ICT. Accordingly, the quality of interaction with the teaching modules was dependent on teaching and learning styles of the institution and tutor experience and expertise, which differed significantly according to the technology status of each school. One of our main considerations in the creation of an e-learning environment was to ensure that learning activities are appropriately designed, which introduce, integrate and apply ICT skills and knowledge regardless of a student's cultural background. Assessment of the project's e-learning system delivered through and supported by the VLE and ODL identified the need for the implementation of particular design functionalities, which would enable quality interaction. These included:

- High quality integrated module information that combines a variety of types of information supporting the learning objectives of the module
- Internet-based communication and submission of assessed work
- Online tutorial support during module delivery

(Gromov, 1998, Shapira and Youtie, 2001)

Further, we considered the development and implementation of a 'knowledge corpus' to support the acquisition of higher-order skills, such as problem-solving, collaboration, transferable knowledge and applications are essential as an integral part of the project's e-learning platform. If this is to be achieved, educators will need to rethink their pedagogical approaches to e-learning and abandon the present linear conceptual framework in favour of a multi-dimensional applications approach. Students need to be challenged in their thinking and problem-solving and at a level that is appropriate to their knowledge and understanding. Tutors were unanimous in their opinion that the ideal design of the VLE should include an *'intelligent platform'*, which recognises the student as an individual learner and which would therefore need to be diagnostic and responsive to individual levels of understanding. Following the assessment of students' existing knowledge, the design would guide the student 'intelligently' through the stages of an activity towards achieving its objective. Students could thus be challenged through a personalised learning program, which suits their individual needs with relevant online tutorial support towards self-directed learning. The implementation of this type of platform would also provide a flexible and distributed delivery that would allow students and tutors to participate in the learning process from any geographic location with the advantage of access to rich multimedia resources.

Furthermore, differences in teaching methodology and preferred learning styles proved to be another issue in the quest to foster collaboration and cooperation across cultural boundaries. The project highlighted the didactic tutor-led pedagogical approaches of several of our European counterparts in contrast to the progressive student-centred UK methodologies. It also identified the need to examine more closely e-learning systems that demonstrate greater interactive flexibility and which address the teaching and learning styles of the various international pedagogic models. Thus ways to develop and implement a pedagogy that works through the medium of ICT to accommodate differing cultural styles is requisite with the primary objective of the transition from a predominantly face-to-face approach to a 'blended' approach where a significant proportion of learning will occur via e-learning.

Differences in pedagogy in each country were noticeable in various ways according to how students were treated and how much autonomy was given. Perceived roles of the tutor reflected strongly in their teaching methodology with respect to assuming the role of leader, guide or facilitator. Furthermore tutor perceptions of students as individuals with different needs and learning styles featured throughout the project regarding the different types of teaching styles employed. Several contrasting methodologies were observed, however tutors tended to adopt either an experiential student-led or didactic tutor-led approach.

In addition, we considered the need for the formulisation of a new pedagogical approach, which would exploit the potential of ICT in teaching and learning, to support a personalised, flexible and learner-centric approach. This would help facilitate empowerment of both students and tutors, whilst producing personalised learning experiences. Dependent on these factors, the establishment of a framework that would deliver customised, adaptable and adaptive learning experiences in a collaborative environment could be perceived as being a realistic long-term target.

The ideal learning model according to current UK practice is one in which the student is central to the learning experience and where the quality of the learning environment is measured against the needs of the learner using a methodology that appreciates differences and preferences in learning styles. The intention is therefore to create and structure material in a flexible way that allows students with different learning styles to study in a way that best suits them and is interesting and challenging (Peters, 2001). The tutor's primary function becomes one of creating collaborative, challenging and supportive learning environments within which the learner assumes an active role, encouraged to take control, make decisions and act in a self-directed manner, whilst at the same time being provided with opportunities for reflection and articulation (Jackson, 1998). The UK partner schools' learner-centric approach follows this model in its reliance on a task-based curriculum content, which is supported strongly and appropriately through the use of design functionalities such as sound, video, images and animation and in which the role of the tutor is one of facilitator. There is little substantive research into the use of this curriculum model other than its evident popularity with students and tutors alike. According to the experience of one of the UK partner schools, it was observed that students work best with the medium of ICT when directed and supported in tandem with the content. The tutor remains the key facilitator and the mode of teaching moves between traditional- didactic and independent learning. The transition to the autonomous learner is made incrementally through confidence gained and whereby the dynamics of the materials presented remain a key feature and act as a motivator to students taking responsibility for their own learning. Finally, the challenge of the task needs to be levelled to the learner's present knowledge and understanding. Norman, (1998) claims that success of an ILS is dependent on designers taking into account the needs, interests, limitations and capabilities of the learner, whilst Robertson, (1985) suggests that designers of such systems have tended to focus on generic models for human information processing rather than the individual differences in users of such systems.

One such solution according to Malo *et al.,* (2004) is through the division of systems into modules based upon the identification of common basic activities of the e-learning education. It involves the creation of study texts, their distribution to the student and the management of courses, which include for example, administration of students, tutors and courses, testing and evaluation and other activities necessary for the running of e-learning courses. According to this model, the concept of the system includes a set of applications for the support of the various activities in the e-learning system, which incorporates modules relating to author, distribution, administration, communication and cooperation, test and evaluation.

One of the main VLE design functionalities was the use of the virtual discussion room, or 'chat room', aimed to provide immediate feedback to students in their collaborative learning. Evidence suggests that the synchronous nature of chat rooms imposes more restrictions on both the student and tutor in time dimension and that its success is largely determined by the effectiveness of its structure and organisational framework, which should allow students and tutors to interact simultaneously, regardless of geographical location. Its effectiveness can therefore be measured in terms of its fluidity, cohesion and quality of interaction at the different levels. The main problem encountered was the

individual European school's systems incompatibility to link up at the allocated time. Schools' differing operational frameworks and complexities in curriculum timetableing meant that it was not always possible to be online at concurrent times. During those periods however when this was achieved, it was noted that students tended to engage in unstructured conversation. The evidence to support this would suggest the presence of a common inherent weakness in online synchronous learning and the extent to which this has been improved upon over the past five years remains to be seen. For example Pincas, (2000) recognises the need for tutors to frame and structure content contributions through a close control over online interaction, calling for structured intervention and interaction on the part of the platform manager and the tutor to enable immediate feedback in terms of correction and consolidation of knowledge specific to the subject. Structure and quality of response is thus an important factor in the success of transnational collaboration and cooperation. Other important influences included partners' levels of motivation and obligation to be present and participating, including students' involvement in learning activities with the aim towards improving learning experiences. It was observed that differing student perceptions influenced their attitude to the content material according to the values held, together with the perceived benefits of the online exercises. Students were concerned with marks gained through completion of the online diagnostic tests at the start and end of each module, including an evaluation test, which assessed students' subject knowledge, rather than the application of such.

Conclusion

To achieve successful collaboration and cooperation across cultural boundaries, there would appear to be a fundamental need for the seamless integration of e-learning into traditional teaching and learning structures. Holzinger, (2000) cited in Ausserhoffer, (2001) refers to this as 'Assured eLearning Integration' (Ael) and supports its development as a standardised process in which he maintains a realistic view, that it is simply not possible to design and implement e-learning from scratch and replace all existing teaching initiatives. Nor is it acceptable to adapt teaching activities to modern technology e-learning in an attempt to make the best of both worlds. It is the difficult formulisation of a personalised union between traditional and technology-based teaching concepts that presents one of the major challenges in transnational cooperation and which needs to be addressed in consideration of the different attitudes and expectations to be accommodated within existing traditional pedagogic models. Cultural variations in conceptions of pedagogy and practice of teaching methodologies were demonstrated and this affected different responses from students and tutors in their approaches to engage with the content material. It is interesting to note how the didactic nature of the online modules was particularly applicable to traditional tutor-led teaching styles and did not necessarily recognise the different teaching styles of the institution and preferred learning styles of the student.

The project's objectives to share knowledge and exchange ideas and experiences within a cooperative environment rested primarily on the implementation of a VLE appropriately designed to accommodate the needs of all tutors and students regardless of the type of cultural background and pedagogy practised.

> 'It is important that technology is not 'bolted on' to a curriculum which remains otherwise unchanged, but rather that pedagogical dimensions of new avenues of information transmission and retrieval are understood and their implications for teaching and course design addressed.'
>
> Reid, (1997)

Despite the inherent design weaknesses of the project's VLE and the technical problems encountered by institutions and their tutors to engage effectively with the technology, the project was deemed successful in raising awareness of the importance of the contributions offered by cooperative e-learning, ICT and the new technologies in the teaching and learning process. It also served to highlight the greater importance of schools' networking, together with the realisation of having taken part in an innovative transnational experience, which has allowed students across Europe to share the same objectives and values in the creation of a common e-learning project.

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MODELLING INTERACTIONS IN LEARNING SETTINGS AND THEIR IMPACT ON THE LEARNING PROCESS

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Abstract

This paper investigates the cognitive impact of certain learner's support factors within the framework of a recently proposed teaching-learning process model (Bordogna and Albano, 2001). The model employs a multidisciplinary approach, based on concepts from sociology, educational psychology, statistical physics and computational science, to asses the impact of a) tutor-learner, b) learner-to-learner, and c) learner-learning resources interactions on the learner's cognitive level. In the paper, we present simulation results on the cognitive impact of the interactions of tutor-learner as well as learner-learner collaborative groups on classes comprising learners of varying achievement levels, namely high-achieving (HA), average-achieving (AA) and low-achieving (LA) learners. We have also performed simulations to assess the learning outcome of homogeneous collaborative groups (consisting of learners with similar initial achievements) and heterogeneous groups (consisting of learners with dissimilar initial achievements). Our modeling results indicate that higher cognitive levels can be reached by collaborative groups.

Introduction

There has recently been much interest in modelling social and economic systems by applying agent-based "microscopic" models in areas such as diffusion of innovation, decision making, adoption of competing products, entrepreneurship, and financial markets behaviour; the research question is usually cast as a "diffusion of innovations" in a social network problem, which is of particular importance in explaining the complex behaviour of system dynamics, focusing mainly on how the impact spreads by gradual local interaction.

There are two main mechanisms involved in the "diffusion of innovations" in a social network that any mathematical model should take into account. On the one hand, there is an external pressure for adopting an innovation (coming, e.g., from a tutor). These external processes are essentially independent of the social network structure.

On the other hand, there is the influence of the surrounding individuals (fellow learners) who define the social network. Once an individual decides to "adopt an innovation" (that is, to learn) those who are in contact with her can evaluate the new payoff the individual has got from acquiring the "learning competence" and compare it with their current benefits. By balancing the payoff increment with the associated upgrading cost (that is, the effort to study), they may decide to learn, or not. In this way, the local flux of "information" plays a key role in learning.

The present paper demonstrates the results of a recently proposed model (Bordogna and Albano, 2001), which simulates the impact of social-network-supported learning (SNSL). This is a model, which can be treated mathematically, solved numerically, and analyzed statistically, in order to assess the impact of the a) tutor-learner, b) learner-to-learner (such as supporting and persuading each other) and c) the learner-learning resources (such as the quality of learning resources) interactions, in enhancing the learning outcome.

We investigate these effects by simulating the learning outcomes of collaborative groups, comparing them to "tutor-only" learning outcomes, as well as the influence of the structure of the group on the achievements of the learners.

According to the results, in the intermediate and long time regimes, learners forming heterogeneous groups (that is, their learners have different initial achievements) or homogeneous groups (their learners have similar initial achievements) reach higher learning outcomes. For the long time regime, the achievement of learners involved in collaborative work is much better than those attending only the tutor lectures. In the short time regime, learning is almost independent of the structure of the group composition. Furthermore, heterogeneous groups obtain better results than homogeneous groups in the long time regime. However, time places an additional constraint: the larger the size of the collaborative group, more time is needed to achieve the higher learning outcomes.

ICT-facilitated flexible learning environments can offer a solution to this problem: by allowing the extension of the duration of the course, they can overcome the time constraint of ending of class at fixed times (such as the end of the school year), which leads to the abrupt end of the learning path, "freezing" the learning process, and not achieving the full learning potential of the learners, particularly those with average to low achievement levels.

The Bordogna-Albano (B-A) model

The Bordogna-Albano (B-A) model is based on the notion of the cognitive impact (CI) acting on an individual person (learner), which is the overall result of the interactions with his/her environment (tutors, fellow learners [peers], learning resources, etc.), capable of modifying his/her learning competence.

The learner can also become a source of CI to other learners by persuading and supporting. The persuasiveness, $P_{ji} \geq 0$, describes the degree to which the i-th learner can persuade the j-th learner. Also, the support, $S_{ij} \geq 0$, describes the degree to which the i-th learner supports the effort of the j-th learner. Within an interactive group, both S_{ij} and P_{ij} become enhanced when learners share similar ideas about the subject under examination; they have social and cultural affinities, etc. The learning competence ("knowledge") of the j-th learner, $\sigma_j(t)$, at time t, is defined as a dynamic variable such as $-1 \leq \sigma_j(t) \leq 1$, where $\sigma_j(t) = 1$ corresponds to optimum learning competence.

The tutor-learner interaction term

Based on these considerations, B-A proposes that the CI of the tutor on the j-th learner [CITS(j, t)], can be written as

$$CI^{TS}(j,t) = P_{jT}[1 - \sigma_j(t)\sigma_T] \quad (1)$$

where $\sigma_T > 0$ and P_{jT} are the learning competence of the tutor and her ability to persuade the j-th learner, respectively. P_{jT} depends on many factors, characteristic of both the tutor itself and the tutor-learner relationship, such as, e.g., the ability and the persuasive skills of the tutor, the presentation of the subject, etc. Notice that CITS is minimal for $\sigma_j = 1$ and $\sigma_T = 1$, because it corresponds to the impact between two learners having the same (maximum) learning competence. Also, CITS is maximal for $\sigma_j = -1$ and $\sigma_T = 1$, due to the largest difference in the learning competence.

The learner-learner interaction term

Within groups of N learners, the CI of the learner-learner interaction CISS(j, t), is given by

$$CI^{SS}(j,t) =$$

$$\sum_{i=1, i\neq j}^{N} \left\{ Pi_j(t)[1-\sigma_i(t)\sigma_j(t)] + S_{ij}(t)\times[1+\sigma_i(t)\sigma_j(t)] \right\} \mathrm{sgn}[\sigma_i(t)/\sigma_T] \quad (2)$$

where the first (second) term accounts for the mutual persuasiveness (support). The structure of these two terms is similar to that of Eq. (1) and it is plausible since it is expected that mutual support will be larger when the learners have similar learning competence (σi σj > 0) while persuasiveness is expected to play a more relevant role in the opposite case (σi σj < 0). It is also assumed that both Sij and Pij are composed of intrinsic and extrinsic (or interactive) factors, so Sij (t) = Soij [σT + σi(t)], and Pij (t) = Poij [σT + σi(t)],, where the intrinsic terms, Soij and Poij , depend on many factors such as the strength of "psychological" coupling, affinity of social status, education, abilities, personal skills, etc. The extrinsic term is provided by a comparison established by the learner with the tutor who assumes a leadership role.

This term is included to account for the fact that the model attempts to describe supervised collaborative group work. In fact, the term [σ_T + $\sigma_i(t)$] means that both persuasiveness and support between learners could be either reinforced or weakened when the learning competence of the tutor is taken as a reference level. In addition, the term sgn[$\sigma_i(t)$ / σ_T] in Eq. (2) explicitly accounts for the plausible fact that a learner with learning competence below the average (σ_i < 0) has little chance to cause an increment of the learning competence of another learner which is above the average (σ_i > 0). Also, due to this term, in the inverse case (σ_i > 0, σ_i > 0), the j-th learner has a great chance to increase his/her learning competence. It should be noticed that CI^{SS} may be either positive, negative, or zero.

The learner-learning resource interaction term

The cognitive impact of the learning resources (such as the bibliography or other sources of information) are given by

$$CI^{BS}(j,t) = A(j)Q(j)\ [1-\sigma_j(t)] \quad (3)$$

where 0 ≤ A(j) ≤ 1 is the ability of the j-th learner to understand the available resource that involves the learner's own capacity to perform critical analysis, and to establish relationships between topics, etc. Also, 0.1 ≤ Q(j) ≤ 1 is the quality of such learning resource.

Implementing the learning dynamics

The learning competence is a dynamic variable influenced by the CI. So, during a time interval Δt, the learning competence changes as follows: $\sigma_j(t + \Delta t) = \sigma_j(t) \pm \Delta s$, where for the calculation σ_j is assumed to be discrete so that Δσ is the "quantum" of learning competence. Notice that $\sigma_j(t)$ has an upper bound given by the maximum learning competence of the available sources, e.g., tutors (σ_T), etc. Also, $\sigma_j(t)$ may improve (become worse) with the probability $P_j = \tau_j / (1 + \tau_j)$ and (1 - P_j), where τ_j is a generalized Metropolis rate given by

$$\tau_j = e^{\beta_{TS} CI^{TS}(j,t) + \beta_{SS} CI^{SS}(j,t) + \beta_{BS} CI^{BS}(j,t)} \quad (4)$$

where each process has its own "noise" given by $1/\beta_{TS}$, $1/\beta_{SS}(N)$, respectively. In fact, for the tutor-learner relationship, the noise may be due to disorder, inappropriate "teaching resource", lack of attention of the learners, obscure explanations, etc.

For the learner-learner interactions the noise $1/\beta_{SS}(N)$, appears due to disordered discussions, misunderstandings, the lack of a well-organized participative activity, etc.

The effect of group structure on the learning outcome

In order to study the influence of the structure of the collaborative groups on the teaching-learning process we have assumed $\sigma_T = 1$, $P_{jT} = 1\ \forall\ j$, and $\Delta\sigma = 0.1$, with $i, j = 1, \ldots, N_T$, where N_T is the total number of individuals. Also, S^o_{ji} and P^o_{ji} are assumed to be randomly distributed in the interval (0,1), so their average value over the whole classroom is close to 1/2.

It has also been assumed that the learners can be classified into three different achievement levels, namely

- "high-achieving (HA) learners" with $<\sigma>_{HA} = 0.5$,
- "average-achieving (AA) learners" with $<\sigma>_{AA} = 0$, and
- "low-achieving (LA) learners" with $<\sigma>_{LA} = -0.5$.

The probability for a learner to improve (become worse) his/her learning competence by $\Delta\sigma$, during a time interval Δt, is $P_j = \tau_j / (1+\tau_j)$ is [or, $(1-P_j)$], where τ is given by Eq. (4).

To simulate this model according to Monte Carlo method, we apply the following procedure: for each learner, we choose a random number u that follows a uniform distribution in [0,1]. If $u>Pj$, then his/her learning competence is improved ($\sigma_j(t+\Delta t)=\sigma_j(t)+\Delta\sigma$), otherwise it becomes worse ($\sigma_j(t+\Delta t)=\sigma_j(t)-\Delta\sigma$).

This is repeated for time form 0 to t_{max} with time-step $\Delta t=1$. The final time, t_{max}, of the simulation is chosen so that the system has reached the state of equilibrium, *i.e* the mean value of σ_j, over all learners, does not change any more.

In Figure 1, we present the time evolution of the learners' learning competence of three different levels, namely HA, AA and LA, with parameters of noise $\beta=\beta_{TS}=\beta_{SS}=1/4$ and $\beta_{BS}=0$.

As can be seen, in the intermediate and long time regimes, learners forming groups reach higher learning outcomes. In particular, for the long time regime, the achievement of learners involved in collaborative work – for all achievement levels – is much better than those attending only the tutor lectures. In the short time regime, learning is almost independent of the structure of the group composition.

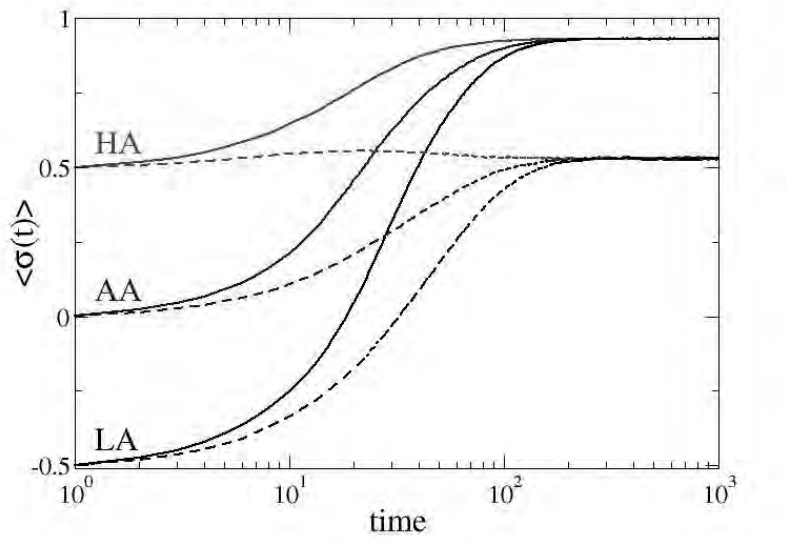

Figure 1. Time evolution of the learning competence of HA, AA and LAblack individuals in two different cases. In the first case (dashed lines), learners only attend lectures of tutor, while in the second one (solid lines), they are also engaged in collaborative work forming heterogeneous groups. The total number of learners is 96, and the number of group members, in second case, is 3. In both cases $\beta=\beta_{TS}=\beta_{SS}=1/4$ and $\beta_{SB}=0$. The results are averaged over 10^3 Monte Carlo simulations.

In Figure 2, we present the maximum achieved learning competence σ_M as a function of noise $1/\beta$, for four different sizes of learners groups ($N=1, 2, 3,$ and 4) [in all cases the total number of learners is 96].

As can be seen, again, learners forming groups reach higher and more robust (more "resistant" to noise) learning outcomes, with larger in size collaborative groups performing better. However, time places a constraint. The larger the size of the collaborative group, more time is needed to materialize the higher learning outcomes. Above N=3, the time constraint can become prohibitively large.

ICT-facilitated flexible learning environments can offer a solution to this problem: by allowing the extension of the duration of the course, they can overcome the time constraint of ending of class at fixed times (such as the end of the school year), which leads to the abrupt end of the learning path, "freezing" the learning process, and not achieving the full learning potential of the learners, particularly those with average to low achievement levels.

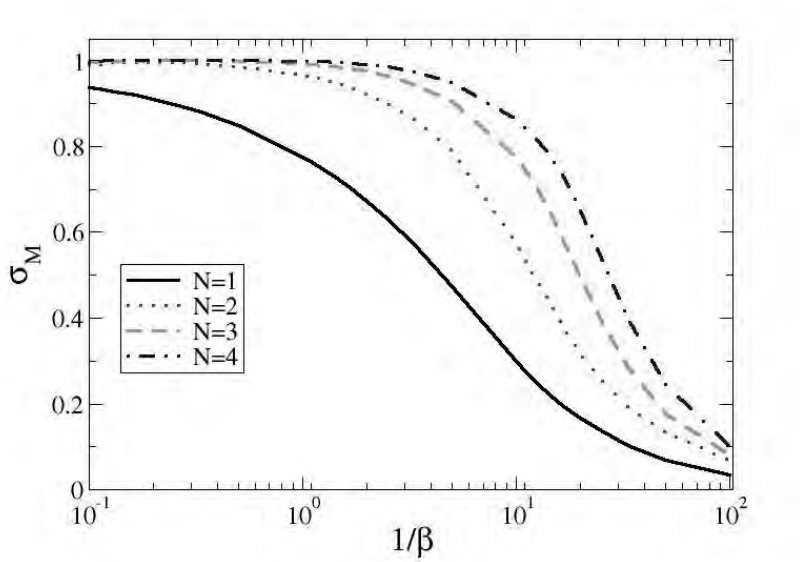

Figure 2. Maximum achieved learning competence σ_M in time interval [0:10^3] as a function of noise *1/β*, for four different number of group member (*N=1, 2, 3,* and *4*). In all cases the total number of learners is 96.

Another factor taken into consideration is the factor of learning resources as it appears in Eq. 3. The effects of this factor appear in Figure 3.

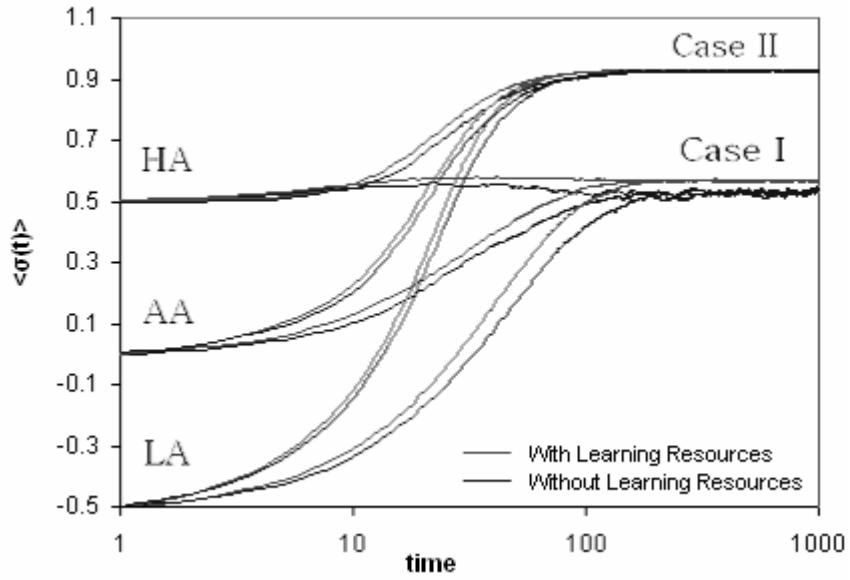

Figure 3. Plots of the time evolution of the knowledge of HA, AA and LA students in two different cases. In Case I, learners only attend the tutor's lectures. In Case II, learners also engage in collaborative work form heterogeneous groups. The blue lines correspond to calculations, in which the factor of learning resources is ignored; the red lines correspond to the calculations, in which the factor of learning resources is included.

Based on Figure 3, the factor of learning resources improves the final level of knowledge only in the case of students only attending lectures. However, as it can be seen, in both cases it can be used as a factor that helps 'speed up' the process.

The difference between Cases I and II can be explained in terms of the fact that learning resources can be used into two different ways. In Case I, students use the learning resources to gain extra

knowledge. Apart from the tutor's lectures students can also derive knowledge from books, which helps them improve their final level of knowledge.

In Case II, students in collaborative groups use earning resources differently. In this case, learning resources such as books can be used as guides or handbooks in order to achieve producing a certain outcome they have been asked to. So, in this case, their main role is to help students achieve their goal faster and conveniently, in other words, 'speeding up' the process of learning.

Conclusions

A recently proposed model (Bordogna and Albano, 2001) has been adopted to investigate the tutor-learner, learner-learner and learner-learning resources interactions and to illustrate the dynamics of the learning (cognitive impact) of a class. In general, learners engaging in collaborative group work are considered to achieve higher levels of learning compared to learners attending only the tutor's lectures. Peer interactions bring learners closer and enhance the learning rate. The class will thus evolve to a higher overall learning level. The fact that the rate of learning depends strongly on the relationships between the learners suggests the possibility of policy-induced changes in the learning settings.

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The present paper extends the results of the Bordogna and Albano (B-A) model:

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THE USE OF ASYNCHRONOUS DISCUSSION BOARDS AS A DATA COLLECTION TOOL IN A COLLABORATIVE E-LEARNING WIRELESS TECHNOLOGY RESEARCH PROJECT

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Introduction

This paper explores the use of asynchronous discussion as a data collection tool with student teachers, subject co-tutors and pupils during a pilot e-learning project on the use of wireless keyboards and mice to enhance learning in Secondary (mother tongue) English teaching. It considers how the data collected through this means contributed to the construction of shared knowledge about wireless peripherals. Key lessons learned and potential benefits for using asynchronous discussion for research involving different communities of practice are identified.

Pilot Study

Within a web-based learning environment, asynchronous discussion using on-line discussion boards is an increasingly acknowledged method of supporting the shared construction of knowledge by different groups of learners (Salmon 2002, Burgess and Shelton Mayes 2003, Murphy 2004). Leach identifies that 'communities of practice' which have been established through the use of ICT networks, including virtual learning environments, enable 'hitherto separately bounded research and school-based communities to connect' (Leach 2001: 392).

The discussion board was one of a number of data collection methods used during the first year of a small scale e-learning pilot study. The opportunity to support and share participants' experiences and developing understandings in the course of an action research project were what first attracted the research team to the potential of asynchronous discussion as a data collection tool. This study involved researchers from the School of Education at the University of Leicester and a convenience sample of six secondary schools from its Initial Teacher Training (ITT) partnership working together to investigate the potential *affordances* (Laurillard et al 2000) for learning and teaching of using sets of wireless mice and keyboards in the secondary English classroom (discussion of *affordances* identified are to be reported elsewhere). The pilot study was initiated as the result of a successful bid to the Teacher Training Agency's fund for *Supporting E-learning Communities in ITT*. The research participants from six schools situated in a variety of urban and rural contexts included subject co-tutors (or mentors), English/English with Media student teachers, who were completing their second teaching practice in the schools, and selected groups of pupils (ages 11 – 15). The principal researcher and discussion board moderator was also the English ITT subject leader. Each school was given a set of seven wireless keyboards and mice and a receiver. When the receiver is linked to a computer, via a USB port, it can connect up to eight wireless peripherals thus enabling one computer screen or interactive whiteboard to be accessed by pupils or teachers from anywhere within the classroom. The project participants were encouraged to experiment by using the peripherals in a variety of permutations for different classroom activities such as collaborative writing, presentations, textual analysis and other Directed Activities Related to Texts (DARTs).

The context of the pilot study and reasons for using a group discussion board

During the academic year 2003 – 04 use of the *Blackboard* virtual learning environment (VLE), was becoming a more developed feature of the Post Graduate Certificate of Education course (PGCE) at Leicester. The PGCE English site was already being used for a number of different purposes such as: collaborative working with peers; accessing course pre-reading and follow-up materials; sharing subject knowledge and limited participation in asynchronous on-line discussion. *Blackboard* was proving to be a helpful communication tool when students were out in schools on their two teaching placements which were, in some cases, a considerable distance from Leicester. At this point, however, the type of communication was predominantly transmitted information about key dates, jobs and events. Other issues were explored through e-mail or by 'phone which meant that limited whole group interaction occurred. Prior to the pilot study co-tutors and other staff working in partnership schools had been unable to access the site.

Although it was difficult to discover any reported examples of discussion boards being used specifically for collection and exploration of incoming 'raw' data, this approach did appear to be a logical and expedient application of the facility. It was hoped that the discussion boards would begin to strengthen the University of Leicester ITT partnership's e-learning dialogue by providing opportunities for discussion and reflection in action (Schön 1983) by all participant groups about the wireless equipment as it was being trialled in schools. Their comments could also generate new questions to explore, thus contributing to the iterative nature of the research process. Technical support could also be provided through this medium.

Triangulation of data was an important element of the research process. Use of the asynchronous discussion boards could enable the research team to access (with permission) three different sets of participants' developing perspectives on the wireless equipment. These perspectives could be compared with data collected through other methods used, namely: lesson observation; pre- and post wireless use questionnaires; analysis of lesson plans, lesson evaluations, materials produced and presentations given by the student teachers to their peers.

Design and intended use of the group discussion board

All adult participants in the project were assigned to an exclusive group within the PGCE English *Blackboard* site. This gave them protected access to discussions about the wireless project. Owing to University restrictions on *Blackboard* access, school co-tutors had to be registered as guest PGCE course members. Their registration also entitled them to a university e-mail account and access to other PGCE English course materials such as student teachers' collaborative schemes of work. (These registrations were to set a precedent for more widespread co-tutor access to the site in the subsequent academic year.) Pupil participants were able to contribute to the discussion under supervision via their teachers' Blackboard accounts.

Seven different discussion 'forums' were set up in the group discussion board area: welcome; technical; stage 2 – familiarisation; stage 3 – the first week of teaching; stage 4 – the second week of teaching; stage 5 – final week of teaching; pupils' feedback on Weeks 1 & 2; pupils' final evaluations. The forums were introduced at staged intervals in order to maintain the pace and momentum of the pilot study. Participants were given a timeline and deadlines for contributions to each discussion. They were asked to read the discussion board and e-mail regularly and contribute to discussion forums at least once a week. They were reminded that other project participants would be able to read their discussion board postings and that their anonymity would be assured if their words were subsequently reported.

The Welcome discussion forum was initiated at an introductory project meeting alongside a personal e-mail sent by the project team to all participants' accounts. The intention here was to welcome and encourage all involved as well as to check that the communication systems were working properly. During stages 2 – 5 and both of the pupil discussion forums, questions were provided as headings for discussion and reflection. Familiarisation questions (stage 2) were designed to gauge participants' initial impressions as they experimented with the wireless equipment back in their schools and at home in the two weeks immediately after the meeting. During this stage, the student teachers and co-tutors began to formulate plans for how they might trial and embed use of the equipment within their English teaching. The questions gave them the opportunity to raise initial technical queries and pedagogic concerns about the hardware. Participants were also encouraged to initiate discussions of their own and respond to comments posted by others. Both the tone and phrasing of the questions were intended to be non-threatening and supportive while provoking detailed reflective responses. To some extent these mirrored elements of Salmon's 'online socialisation stage' (Salmon 2002:11) in that all participants were familiarising themselves with the new equipment. However the fact that all participants had previously met and were working within the same ITT partnership arguably reduced the need to 'build bridges between cultural, social and learning environments' (ibid).

The Stages 3 – 5 questions were similar to each other. They included opportunities for sharing information but were essentially designed to help the participants break their experience down into manageable chunks so they could reflect on different aspects of it in a concentrated way. This would, in turn, move participants on towards Salmon's level four and five behaviours of knowledge construction and development (ibid). The questions prompted in-depth reflection on successes and difficulties with the equipment at each stage. They maintained a focus on pupils' learning, enabled the research team to keep track of any changes to previously shared teaching plans and also invited further reflection on issues previously raised.

Pupils were asked to contribute to the group discussion board at two stages in the data collection period. Firstly, they provided feedback during their second week of using the equipment and secondly to participate in a final evaluation at the end of the project. The questions were simply phrased and open, in order to make them accessible to students across the 11 – 16 age/ability range. They were designed to encourage reflections on the practicalities of using the equipment and the pupils' learning in their English lessons. Each pupil participant was asked to state their name and school when posting a message.

Patterns of participation in the asynchronous discussion

A review of patterns of participation and *Blackboard* access statistics indicates that student teachers and groups of pupils were the most active participants in the discussion forums responsible for the majority of posted messages while co-tutors preferred to browse[1]. The highest number of postings occurred in project Stages 2 – 4. Over the whole project period the level of student teacher active participation was variable. All, however, posted on average at least one comment each per week. For some group members the discussion board served largely as a depository for responses to forum questions or as a reference point rather than a place for interaction. Other participants were more actively involved. They responded to other postings, provided further information or asked questions about technical matters. Although the discussion boards were only in operation for a seven week period, by the end of the project some individuals were already beginning to demonstrate characteristics of participatory patterns as defined by Salmon (2002). Amy displayed features of an 'elephant' (Salmon 2002: 171). Her participation was steady: she kept regular contact (both through the discussion forum and via e-mail). Her contributions raised questions about other people's projects and encouraged them to discuss their teaching plans. The ability to weave in references to other projects demonstrated her potential as a future moderator. Emma was perhaps more of a 'wolf' (ibid) as she contributed a great deal to the first two discussion forums and then seemed to disappear from

[1] For Salmon 'browsing' is a 'safer' term than lurking (2004:36)

the VLE for several weeks. In contrast, Hannah showed 'squirrel' (ibid) tendencies: she sometimes posted her messages incorrectly or apologised for missed deadlines. Both students were contacted individually to be reassured and encouraged to contribute further.

Reflection in action by the student teachers did not take place solely within the discussion forum framework. Student teachers' lesson evaluations provided an additional structure. E-mail, phone conversations and face to face tutorial discussions (with the main researcher and other university staff) were further methods of 'spoken' communication used. It was important for students and co-tutors to know that these other options were open to them: they provided more secure and private opportunities for personal reflection and support. All seven student teachers had been in regular e-mail contact with their university tutor prior to the project and five of them seemed to prefer to communicate their initial thoughts about the project through this medium. These initial thoughts ranged from the euphoric *'I am in love. This equipment is going to revolutionise the classroom…'* to the concerned *'I feel a bit uneasy about posting a negative response on the message board about the 2 lessons I've had this week using them so will try to look for the positive.'* In the first three weeks, some student teachers' e-mails combined project discussion with correspondence about other aspects of their PGCE course such as Newly Qualified Teacher timetables, job contracts and assessed tasks. This mixed agenda probably made it more convenient for them to continue communicating in this vein. However, the e-mail contact could be said to interfere with or even contaminate the discussion forum data: other e-mail addresses were not copied in by senders thus making it more difficult for other participants to keep up to date, be reassured or inspired by their colleagues' progress. This was a concern and the discussion forum moderator endeavoured to share (with permission) key e-mail observations with the other participants.

Groups of pupils from each school added their comments once a week on average to their two discussion forums. There was some overlap (in terms of contributors) between the first and second discussion forum. However, because each school was using the wireless equipment differently with different group sizes, not all of the pupils participated in every project lesson. On-line web access during English lessons (in addition to access to a computer and digital projector) was also not always available. This caused a delay for some pupils in following up comments posted by others. Nevertheless pupils did make valuable contributions. They pinpointed a number of concerns about the equipment, made suggestions about its potential use and, in one instance, highlighted potential differences in equipment use between their all male group and an all female group in a different school.

As a discreet group, co-tutors did not contribute individually to the asynchronous discussion but they did complete pre and post wireless-use questionnaires and were active tutors who provided feedback on lesson plans, observations and guidance in weekly progress meetings. Their lack of individual involvement in the discussion forums was concerning, and perhaps has implications for the future development of discussion forums for educators, but it not entirely surprising given the limited use of discussion forums by professional groups (such as head teachers) in UK school contexts. Nevertheless the lack of active involvement could be explained by a number of factors such as: the co-tutors' interpretation of their support and guidance functions; perceptions of the student teachers' 'ownership' of the wireless English lessons; the pressure on co-tutors' time and their ease of regular access (or otherwise) to an internet connection in school. Some joint contributions were posted by student teachers and their co-tutors. This pattern began with one student, Amy in School D who sent both joint e-mails and discussion forum messages and whose co-tutor appeared to be the member of staff most actively involved in the project. The use of a dual signature on messages was replicated by three other students during the first and second weeks of teaching. Reasons for this approach are more difficult to gauge. One could question whether the student teachers themselves were aware of a lack of individual co-tutor contributions and wanted to indicate to the rest of the wireless group that their co-tutors were participating in and/or supporting the project. It could also be argued that Amy's first dual posting could imperceptibly have alerted other student teachers of the perceived need to demonstrate co-tutor participation.

Although discussion forum messages provide a physical indication of participation they are not the only signs of involvement in the on-line aspect of the project. Throughout the project the forums were browsed regularly and every posting was read by almost all adult members of the wireless group. The site was also accessed during every hour of the day except between 4 am and 6 am. All the co-tutors accessed the site every Monday during the project to browse while other participants logged on most week days and sometimes at weekends. In talking to co-tutors during observation visits, it was evident they had been following the on-line discussion and a number commented on what they had read about issues arising in the other project schools.

What did the discussion contribute to the emerging data set?

A number of technical and pedagogic issues about the use of wireless technology were raised during the course of the project both in direct response to discussion forum questions and in addition to these *(see Figure 1).* Although it is difficult to replicate the complex web of discussion that developed from each of these initial postings, this chronology demonstrates how student teacher participants especially were using the discussion forums to make sense of a range of issues connected with their own developing pedagogies as beginning teachers and their skills as users of ICT. Pedagogical and practical issues featured side by side in many of the postings. For at least three weeks of the discussion board's life some contributions touched on technical points such as: rules for equipment use; flexibility of the peripherals in different locations; battery life; mouse sensitivity; channel switching and the delay between signal reception between each device. The student teachers revealed both optimism and anxiety about the equipment and its potential applications. They diplomatically observed the way other more experienced teachers reacted to the wireless devices. Furthermore they reflected on and sought advice on other aspects of ICT such as *Word* shortcuts, keyboard mouse functions and use of the interactive whiteboard. These participants directly explored the logistical problems and everyday mishaps which can be a feature of using ICT in any school such as intranet failure and an interactive whiteboard unplugged by a cleaner. In the early stages of discussion it is interesting to note the occurrence of vocabulary connected with bravery and risk taking and how the student teachers supported each other through use of these words. The technology itself was not the only aspect they could be said to be taking risks with: use of different small group structures within the classroom and the opportunity to engage pupils in independent study were also risks which some of the trainees were trying out for the first time. In their post-use questionnaires and presentations to their peers, some students continue to use this language. They describe the rewards they have found in taking risks and giving pupils more ownership of their learning during this project.

19/5:	use of keyboard function keys
22/5:	appropriate font size for interactive whiteboard (IWB)
	use of *Word* short cuts
	availability of battery replacements
24/5:	successful technical set up
	amazement at receiver range
	rules for equipment use
	mouse to be used first by teacher as a control
	impact of 1 keyboard on small group
	use of equipment with whole class = 'brave'
	small group projects more manageable?
	ICT teacher 'monopolising' equipment?
	some keyboards non-functioning
	student teacher solves technical problems
	potential interference of different receiver channels
	ease of movement round classroom with keyboard
	trialling same activities with & without equipment
26/5:	delay in channel switching
	slowness of pupils' turn taking
27/5:	decision to use pupils for peer training
28/5:	public exposure of weak spellers
2/6:	reduction in number of devices used at one time
	keyboards' eventual relegation to back of cupboard?
	'normally quiet' boys motivated by keyboards
	slow grid completion via IWB
	keyboards used effectively to highlight key words
8/6:	benefits for collaborative learning
	pupils can support & correct each other's spelling
	requirements of fast paced lesson
	pupils' enthusiasm for use of keyboards
	'fantastic' reviews written
	how much do the keyboards contribute to learning?
	circumventing public exposure of weak spellers
	channels need reprogramming too often?
	use equipment in conventional classrooms
	planned teaching activities may need adapting
	wireless mouse awkward to use
	equipment useful for sharing ideas
9/6:	all 7 keyboards working
	short battery life
	scrolling & loss of work on an IWB
11/6:	effective group communication & task allocation
	ICT prep lesson for equipment familiarisation
	keyboards are better shape for girls' hands?
	looking at 'big' screen
	keyboards in Technology, Science, Maths, MFL
	equipment 'weird' to use
14/6:	value of activities for speaking and listening
	constant good level 5[2] work rather than improvement
	use of more discussion prompts?
	improved use of keyboard functions as benefit?
	improved pupil and student teacher spelling
	boards useful for pupils with handwriting problems
	equipment 'cool' to use
15/6	keyboards used successfully for Yr 10 revision quiz
17/6	pupils' confidence
	some tasks don't benefit from use of equipment
	suggestion of building a mouse pad into keyboard
	keyboards most useful for less able pupils
	one keyboard per pupil preferred?
	boys' hands too large for keyboards?
18/6	frequency of equipment use by less able pupils
20/6	successful collaborative textual analysis
	'tangible outcomes' & greater consistency of response
	time wasted /falling behind with scheme of work
	intensity of project/obligation to use equipment
21/6	increasing understanding through scaffolded writing
22/6	some pupils eager to use equipment, others not so

Figure 1. Chronology of Emerging Issues (first appearance of each issue)
[Student teacher inputs = normal font, *pupil inputs = bold italics*]

Collaborative small group learning became an increasing focus once participants had become more familiar with the equipment. From June 2nd onwards, guided in part by the discussion questions they were asked, the student teachers moved towards 'knowledge construction and development' (Salmon 2002:11). They began to comment on other ways they might use the equipment in the future and to reflect more fully on its impact on learning by raising questions about pupils' individual progress in their English lessons. Pupils' achievements in developing their speaking and listening skills, spelling, understandings of texts and contributions to collaborative writing were the key topics for discussion along with the consideration of inclusion issues. The pupils who had tried out the keyboards included a whole mixed ability class of 11-12 year olds, small groups of 12 – 14 year old very able boys and girls and a group of 14–15 year olds, a number of whom had specific learning difficulties. An early posting about inclusion explored concerns about public 'exposure' of weak spellers within a large mixed ability class. However other participants found that when a group of less able pupils worked exclusively together, using the keyboards and an interactive whiteboard, they became much more supportive of each other, keen to correct each other's spellings and to discuss imaginative vocabulary choices. By the end of the project there was a growing perception that sets of keyboards and mice had most potential when used as a motivational tool to support collaborative learning with very small groups of learners of similar abilities.

[2] Level 5 is a National Curriculum assessment level in English (average attainment for pupils aged 14 in England & Wales)

Lessons learned about using the discussion boards for data collection

In considering participants' views on the discussion forums, it is important to be aware of a possible 'halo effect' in their responses. Through the ITT partnership, all the adult participants had a continuing professional relationship with members of the research team that could have caused them to feel obliged to respond favourably in their final evaluations. However, these participants, and the pupils involved, were encouraged to be critical at every stage of the study. The majority of student teachers appeared to welcome use of the discussion forums as a 'positive' experience which confirmed the shared nature of the project. They valued the teaching ideas, feedback and support gained from participation and two commented specifically that the questions provided structure to the discussion. Two other student teachers specifically noted the time pressures of regular involvement. Interestingly none of the co-tutors had belonged to a web discussion group before. The majority took the opportunity to read (but not to write) contributions regularly as well as to visit other parts of the English PGCE site. One co-tutor had been surprised by how straightforward the forums were to use with pupils. Another participant remarked on the 'relative immediacy of the feedback' and a third co-tutor noted the value of the discussion forums for pupils who were able to 'reflect on their own learning'. Pupils in the project were, to an extent, able to contribute their views and experiences and to have contact with a university research team, pupils and teachers in other schools. For some this was seen as an exciting aspect of their project role. One teacher observed that her pupils were very keen to send and receive messages. However sending the messages did cut into the amount of available lesson time. Arguably, the fact that pupils had to access discussion forums via their teacher's Blackboard account during their English lessons affected both the spontaneity and the regularity of their responses.

Ultimately use of the web discussion does appear to have aided some aspects of the process of data collection. Many of the reasons for using the discussion board, previously outlined, appear to have been warranted. The forums gave a degree of immediacy, enabling the research team to gauge different perspectives on the use of the equipment as it was being trialled and to follow up emerging issues both on-line and through observation visits. The team were also able to offer pedagogical and technical support when required which was used by most student teachers. Perhaps the strongest factor was the development of shared questions and understandings amongst participants across the learning spectrum. Use of the discussion board served to reinforce and broaden a sense of a training partnership and to provide a model of e-learning which is now being refined and developed further for use in September 2005 onwards.

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STANDARDIZING TEACHERS' DISTANCE TRAINING

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Abstract and Introduction

Many arguments have been raised lately about the usability and the appropriateness of standardization in Educational Methods. The variance is widened when the matter comes to terms of Distance Education and Training which ultimate goal is to provide more effective Educational procedures and Teachers' Professional Development. The popular rhetoric of educational reform is increasingly colored with the terminology of standards, as public policy is all the more focused on schools' outcomes, such as student achievement, graduation rates, and drop-out rates. And what about inputs to schools and the Educational procedure? What about the appropriateness of the Educational Material, the suitability of the Educational Process that is followed to provide this material and the Technological Means used for this purpose? Do or do they not contribute to the formation of the abovementioned outcome?

This paper is trying to give the real facts about using standards in education and of course to propose methods about the implementation and setting up of distance learning. It presents the actions that have taken place through out the implementation phase of an educational procedure providing distance education. The reason that standards have not yet been implemented in the educational procedures and specially to the distance learning courses is mainly the fear of stakeholders (authorities, institutions, educators, even the students) in using and implementing standards as well as the lack of the existence of a guide about how to organize all the needed processes and procedures for the implementation of a distance learning course. If technological solutions and all the information and communication technologies (ICT) are to be used in the educational procedure, a clear and precise Implementation Guide is needed to be present.

Using Standards

At one time, standard-setting (the process of defining points for educational decision-making) was primarily of interest to measurement specialists and psychometricians. Now on both the national and international levels, educational administrators and policy-makers are engaging both educators and noneducators in formal exercises to define acceptable and/or desirable levels of student performance for the school system [1]. As such, the process of setting educational standards can be seen from a number of perspectives. Standard-setting can be viewed as a(n) [2]:

- forum where the match between what educators intend to do and what they actually have done is deliberated,
- intersection where educational ideals meet reality,
- exercise which gives voice to the underlying appreciative knowledge of professionals and nonprofessionals about the potential for youth,
- evaluative process for placing an interpretative framework around assessment data in either statistical and textual form,
- due process mechanism for adjudicating outcomes for a school system,
- psychometric technique for calibrating test questions,

[1] Q-Plan S.A. is a founding member of the European Foundation for Quality in e-Learning (EFQUEL)

- means for applying social meaning to measures of learning,
- instrument for clarifying professional and public expectations about curricular and instructional effectiveness,
- public policy arena where competing stakeholder interests and values are drawn together and reconciled to define education system outcomes for public accountability purposes, or
- decision-making process which in turn establishes points for further educational decision-making.

Because it both represents and reflects diverse values about what we think important in education, a standard is often subject to controversy [3]. Virtually all scholars concur that standard setting is a judgmental exercise. A standard therefore can be only as good as the judgments and evaluative processes used in setting it. Popham has argued that serious standard-setting which relies, "on decent collateral data, wide-ranging input from concerned parties, and systematic efforts to make sense out of relevant performance and judgmental data is not capriciously arbitrary [4]. Rather, it represents the efforts of human beings to bring their best analytic powers to bear on important decisions".

Critics usually adopt one of two lines of argument when questioning the credibility of standards. One is based on the belief that testing and standards represent a form of standardization that denies the individuality of people and undermines the unique, transactional nature of teaching [5]. Large-scale assessments provide educators and trustees with beacons and external referents to guide successful professional practice, in the same way radar guides a pilot around the airport and safely onto the runway. No one can say that radar measurements and flight standards detract from the pilot's skill and harm the passenger, even though they certainly do shape the flight path in positive ways.

The second criticism is that standards, because they are human creations, are arbitrary [6]. It is true that all methods are arbitrary in the sense that there is no scientific procedure which simply involves plugging numbers into a formula. Different methods will produce different standards. Yet we must not label standards as unacceptable just because they are arbitrary. The word "arbitrary" can mean either "that which is determinable by a judge or tribunal" or whimsical, that is "selected at random and without reason". When criticizing standards as arbitrary, critics are clearly employing the second, negative definition, whereas the first definition more accurately reflects serious standard-setting efforts. Even if standard-setting is subjective, Livingston and Zieky (1982) point out, "once a standard has been set, the decisions based on it can be made objectively. Instead of a separate set of judgments for each test taker, you will have the same set of judgments applied to all test takers. Standards cannot be objectively determined, but they can be objectively applied" [7]. In short, a standard enables equality of treatment, as much as it permits judgments of educational quality.

Finally it must be taken into consideration to everyone that wants to set standards in the educational procedures that must work at least on two categories of standards [8]:

- Technical Standards
- Educational – Learning Standards (methods, practices etc)

There are already standards in the field mentioned above and are ready for use[2]. Some of them are already implemented in some European or National Research projects[3].

[2] http://www.cenorm.be/cenorm/index.htm, http://www.iso.org/iso/en/ISOOnline.openerpage, http://www.etsi.org/.

[3] ZEUS Project in Greece (www.dias.ea.gr), CONNECT Project (www.connect-project.net), many project of ESA (http://www.esa.int/export/esaCP/), and many projects of European Commission in the action of Technology Enhanced Learning (http://www.cordis.lu/ist/directorate_e/telearn/projects_fp6.htm).

Need for the Implementation Guide

In order to use standards in the educational procedures and especially in schools and courses that use ICT, it is essential to realize some specific actions such as:

- Every initiative that is based on ideas and proposals concerning the educational procedure must be realised and accompanied by specific processes and procedures that must be identified and followed.
- Every project concerning the implementation of educational applications must be accompanied by an "Implementation Guide"
- Recommend the standardization of the methodologies and practices, and even more the evaluation scheme. The availability of a standardization scheme is particularly important, as is the establishing of conditions conducive to change and to adaptation of the ways in which education and training systems are organized.

The Implementation Guide in educational procedures seems to be the most important success factor. It aims at providing the necessary instructions so that the effort invested in the Educational Procedure will be continued, occurring problems will be tackled and distance training will be further developed and used. In such a project named ZEUS – aiming at providing distance training via satellite to teachers in multigrade schools in rural areas – the implementation guide included main tools and methodologies to be implemented in the training process and described how satellite can be used as a distance learning tool, following those methodologies and implementing those tools.

The implementation Guide must emphasize on the new way of teaching and learning the use of new technologies and technical aspects. It will invoke changes on how the target groups are educated, how their performance is assessed, and on the relationship between the educational institution and the rest of the community. It will be the first step on a journey of educational reform that might take many years. It will be the map. Achieving high quality training requires the combination and continuous support of all involved actors, researchers, policy makers and curriculum developers, educators, teachers, students and parents. The Guide should describe analytically the developed pedagogical approach and it must include the practices and the methods for the implementation of the "classroom" activities as an example of good practice. Among others the guide could address the following points:

- Fields and subjects suitable for the introduction of the new tools at the primary level of education.
- Motivating and de-motivating factors influencing the application of ICT for training and professional development.
- Organizational aspects (prerequisites, infrastructure, necessary person-power) for a successful implementation.
- Specifications for the technological infrastructure.
- Description of Standard critical processes and procedures that are needed to be deploy.
- A standard management framework with critical management processes that are needed in order to assure the level of quality for the proposed training program.

The Implementation Guide must contain all the specifications, practices and methods that are needed to implement e-Learning in the proposed way and it must be separated in three sectors:

- training and education specifications (methods and practices)
- technological specifications (methods and practices)
- specifications for providing the integrated service (methods and practices)

Special care must be given to the presentation of the evaluation scheme and the evaluation results that are expected to provide arguments in favor of the proposed learning scheme and the ICT application to the targeted groups. This evaluation procedure must be recommended in order to have a continuously improving training program with high quality standards.

The evaluation scheme, the methods and practices have to follow a systematic and continuously improving way of implementation. A complete evaluation and improvement plan has to be developed, based on details and crucial parameters for the project's success, aiming at the definition of its advantages and disadvantages and at the proposed actions for the project's improvement. This is accomplished through the Implementation Guide that will recommend the standardization of the methodologies and practices, and even more the evaluation scheme. The availability of a standardization scheme is particularly important, as is the establishing of conditions conducive to change and to adaptation of the ways in which education and training systems are organized. Furthermore it has to be considering the technological parameter. The steps to confirm whether methodologies and practices that are standardized are the appropriate are presenting in Figure 1. After the evaluation and the data analysis there will be enough information in order to start writing the Implementation Guide.

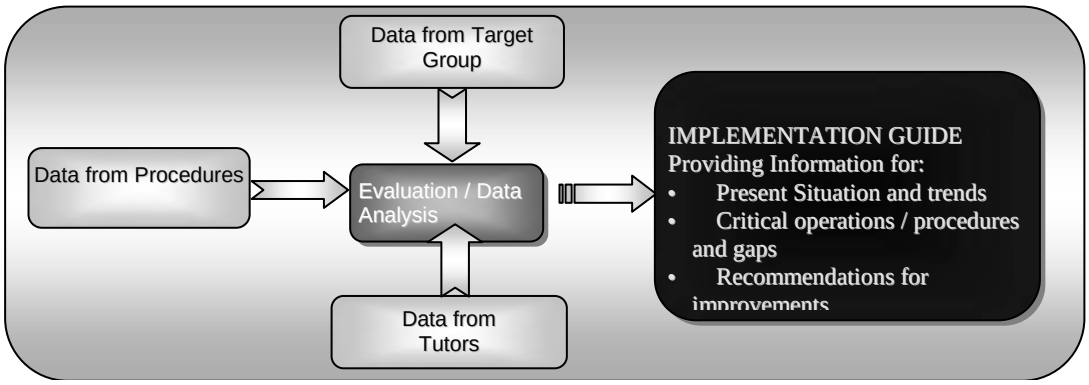

Figure 1. The proposed approach for the development of the Implementation Guide

The evaluation scheme must be organized in a way to assure that all the modules that are important in the implementation of the educational procedure are evaluated. Hence the evaluation must be realized to all the categories that are shown in Figure 2 to cover all the fields of the evaluation.

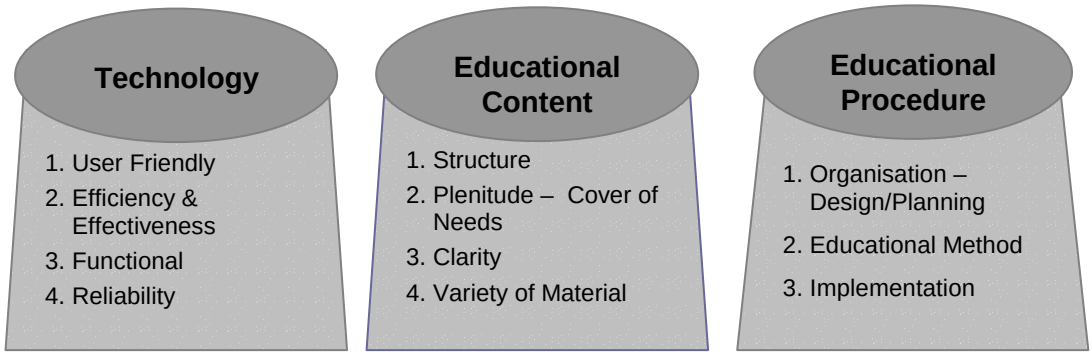

Figure 2. Categories of the Evaluation Scheme

In order to collect all the abovementioned information it is important to use some instruments [1]. These instruments must be selected and used in such a way in order to have the most objective results and hence the most reliable evaluation for the education procedure that was followed. The most reliable process is the combination of the following instruments:

- Questionnaires filled by trainers and trainees during the Educational Procedure.
- Video Recording of the teaching procedure and the teacher's inside and outside class action.
- Interviews with the teachers regarding matters relevant to their distance training.

The most important procedure after the collection of the data is the analysis of them and the criteria and factors that will be used for the evaluation. The statistical analysis must be already set up before the implementation of the courses and must be included in the Implementation Guide. Also, as long as the evaluation scheme is considered, questionnaires should be sent before the beginning of each phase while interviews with teachers should be placed at the end of each phase, in order to achieve the most objective and thorough viewpoint of the project's progress based on the facts before and after the training procedure.

In order to be as effective as possible, the evaluation scheme must focus on providing a way for continuously improving the Distance Education and/or Training process such as the one proposed in figure 3. The Educational procedure through which educational material will be delivered to the teachers should be divided in educational cycles. Those cycles must be structured in such a way that results, conclusions and malfunctions of the first educational cycle, act as examples to be copied or avoided and serve as a vault for improving the distance-training-provision process. For that reason, each cycle should be a separate, self contained scenario of educational process, able to be evaluated independently however consisting part of an overall educational procedure which is aiming at providing specific skills to the teachers and contribute to their professional development. After the completion of all the training cycles and after all data is collected and improvement suggestions are formed and implemented, final evaluation and comparison of the training cycles should be materialized in order to detect:

- Whether correction actions were achieved
- Whether the whole project was improved compared to its initial form
- Which are the alternative improvement scenarios for future implementation of distance training

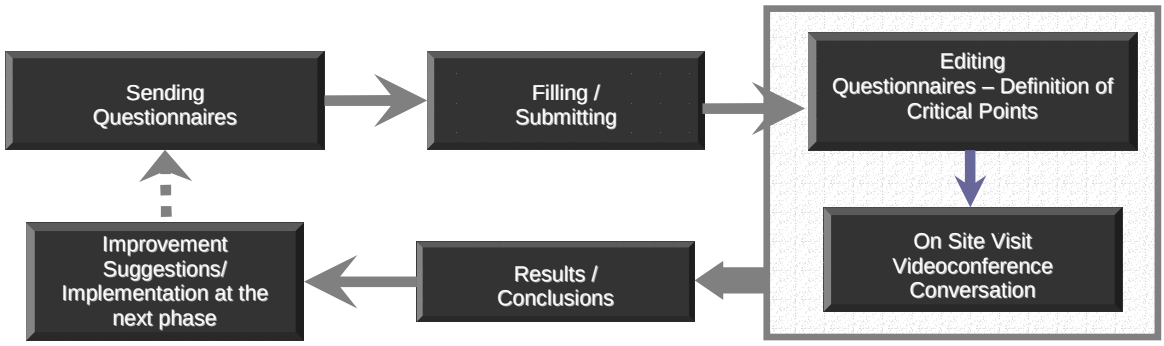

Figure 3. Parameters of evaluating Distance Education/Training Process

Summarizing, it has been already proved that by standardizing the procedure of providing distance learning and putting it in a pathway that can be continuously supervised, the whole procedure's effectiveness is enhanced, new teaching methods are introduced and old ones are improved while malfunctions are minimized with the assistance of the evaluation process. Hence the whole classroom and/or the course are advanced to a higher educational, technological, cultural and contextual level. And this is where the benefits for the teachers stand at. As each teacher comprises a member of a continuously improving total (improved teaching methods, media, classrooms, more attentive students, more fair and realistic evaluation criteria and methods etc.) he/she is more motivated and take the appropriate actions to enhance his/her skills and competencies in order to come up with the continuously raising demands of the stakeholders.

Conclusions

The Implementation Guide must be considered as an essential need in order to successfully set standards in the educational procedure and especially in using ICT. The objectives and the aim of developing the Implementation Guide are:

- To create a training framework that corresponds to the needs of the stakeholders (teachers, students and the community)
- To identify and present the best training practices and methodologies
- To standardize the educational procedure
- To present a model for continuously providing training and support to the stakeholders
- To establish a standing procedure evaluating the training framework in order to continuously modify and adapt new procedures or methods in the creation of a user friendly environment
- To identify and follow the basic principles and standards of an educational program

The Implementation Guide contains all the specifications, practices and methods that are needed to implement e-Learning with a proposed way (e.g. Open and Distance Learning via broadband networks) and it is separated in three sectors:

- training and education specifications (methods and practices)
- technological specifications (methods and practices)
- specifications for providing the integrated service (methods and practices)

In the presence of an Implementation Guide both the trainer and the trainee can be confident that most of the factors influencing the effectiveness of the Distance Educational procedure, are following specific and tested standards which are defined by best practices and are continuously improved through an internal evaluation mechanism focused on locating gaps, malfunctions and differences in their perceptions. Hence the development of an Implementation Guide and the standardization of all the undertaken activities will provide the needed quality in distance education and of course will grant teachers with all the needed skills.

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A CURRICULUM FOR HIGHER EDUCATION AND TRAINING: SOME CHALLENGES

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Abstract

The purpose of this paper is to report on research conducted on the problems which South African educators experience in predominantly Black primary and secondary schools. The aims for this kind of research study were:

- To identify the main teaching problems that South African educators experience in the classroom in predominantly Black schools.
- To establish some considerations, when designing a curriculum for Higher Education and Training (HET), that would alleviate the problems experienced by educators.

A study of relevant literature on curriculum design was undertaken, to provide a conceptual framework for the recommendations that should be borne in mind when designing a curriculum for HET. Seven focus group interviews were conducted in Gauteng and the Northern Province. The data analysis included verification on the transcriptions by the respondents, an independent decoder's report and a literature check, to ensure reliability and validity. The following categories of educator's problems were identified:

- Multi-religious education
- English as the language of teaching and learning
- Condition of buildings and inadequate resources
- Professional support
- Classroom discipline
- Learning area specialisation

The above categories were then interpreted and integrated with the conceptual framework and offered as guidelines for a relevant curriculum for HET.

Introduction

African educators in general and South Africans in particular in both primary and secondary schools experience serious teaching problems in the classroom. Various researchers have conducted researches worldwide, with the aim of identifying teaching problems of educators. Goody and Brophy (1997:260) maintain that the attitudes, skills and understanding of an educator in the classroom, as well as the work context itself, determine what problems will be faced. Shulman (1997:30) points out that the needs of novice educators are unique to their jobs-needs that are not addressed in the curriculums implemented at all institutions of higher learning. In the South African context, the problem manifests itself in a special way and the question remains, namely what problems do educators in predominantly Black primary and secondary schools experience?

Research aims

The following aims were set forth for this research project:

- To identify the kind of teaching and learning problems that South African educators experience in the classroom in predominantly Black schools.
- To establish some considerations that would alleviate the problems experienced by such educators when designing a curriculum for HET.

Methodology

Focus group interviews were conducted in Gauteng (Mamelodi, Alexandra, Soweto and Sebokeng) and the Northern Province (in the former Lebowa, Gazankulu and Venda). Due to time constraints and costs effects, it became impossible to conduct interviews in the other seven South African provinces. Schools selected from the above areas, were chosen on the basis that they had a high failure rate.

Each interview consisted of a group of six to eight educators from primary and secondary schools. In one school the interview was brought to an end when the principal insisted on becoming one of the respondents. Cassette recordings eased the burden on the interviewer and enabled him to concentrate on conducting the discussions. Transcriptions were taken back to the respondents to verify their reliability.

Apart from the principal decoder, there was also an independent decoder. Transcriptions were decoded by the principal decoder, and then given to the independent decoder for analysis. Conclusions from the two decoders were then compared. Where there was a discrepancy, a final conclusion was reached after a discussion among the decoders. This was done in order to guarantee the reliability of the data.

A literature survey also addressed the problem of validity. It was incumbent upon the researcher to compare his findings and conclusions with that of similar research. This was done were applicable, to ascertain if research that had been conducted in other contexts arrived at more or less similar conclusions central to this research. A literature study on curriculum design was undertaken in order to select a suitable model of curriculum design and principles of design. The selected model served as a conceptual framework for the considerations. The researchers integrated the conceptual framework with the empirical data, when offering considerations for a relevant curriculum for HET.

Conceptual framework

There is no universal agreement upon a definition of the concept of curriculum. Different scholars define the curriculum differently at different times. This might be attributed to the fact that curriculum in its widest sense is at the heart of education and education itself is value-laden. Definitions vary in their focuses from content-centred to learner-centred. The following definitions focus on the learner and the outcomes and seem to be appropriate for this study: The curriculum is seen as an organised set of intended learning outcomes leading to the achievement of educational goals (Messick and Reynolds, 1996:56). The curriculum is also seen as ”the experiences that individuals have in a program of education whose purpose are to achieve broad goals and selected specific outcomes” (Parkay and Hass, 1997:7).

These two definitions are complemented by Kruger’s (1994:19) operational definition, namely that a curriculum is a program for teaching and learning in which a dynamic interaction consists between the following principles of design; situation analysis, aims, goals and objectives, learning content, learning opportunities, learning experience and evaluation. In this definition, six principles are

acknowledged as well as the interdependence of these principles. This definition seems to present a more balanced approach to curriculum design, as it views the principles as being of equal importance.

Kruger's model (1994) has been accepted as a theoretical framework for the considerations and recommendations of this research. The six principles will be discussed separately and sequentially. They are, however, related and interdependent, and combine to form a cyclical process.

Situation analysis

Van der Horst and McDonald (1997:173) are of the viewpoint that situation analysis refers to finding out information about the learners at the beginning of a lesson, year et cetera. A situation analysis is sometimes termed a "diagnosis of needs." Marsh (1995:79) views a situation analysis as a springboard for curriculum development. It is, however, not a preliminary phase as Wheeler (1998) suggests, but an integral part of the process of design (Kruger 1994). The process must be maintained throughout the designing of the curriculum. The following determinants of a situation analysis are identified (Kruger 1994, Marsh 1995 and Longstreet and Shane 1997):

- The school and internal factors
- Cultural values and social change
- Learners' needs
- Society's needs
- Facilities,
- financial implications
- subject discipline

In this study, a limited situation analysis was undertaken. These problems which South African educators experience in their classrooms were identified and interpreted. These needs should also be reflected in the other principles of curriculum design.

Data analysis

Findings are based on the research instruments and literature review. Based on the analysis of data, a number of related categories have been identified and the discussion thereof follows underneath;

Multi-religious education

Bennett (1998:201) defines multi-religious education as an approach to teaching and learning that is based upon democratic values and beliefs, and affirms cultural pluralism within a cultural diverse society and an interdependent world. Wellington (1996:8) contends that religion might be defined in terms of say, six major world faiths namely: Buddism, Christianity, Hinduism, Islam, Judaism, Sikhism-based on tradition, rather than on decree. Teaching in a multi-religious classroom is a daunting task, which warrants responsibility and faithfulness. A dilemma is always experienced when educators have to start each day with a morning prayer in their classrooms. Although the South African constitution accommodates all world religions, it becomes a mammoth task for educators to please all learners in a multi-religious classroom. It is in this respect that the National Department of Education recommended that South African schools should in future be required to implement a pledge of allegiance instead of prayer.

It is evident from the interviews that the issue of multi-religion is a major problem in the classroom. Although the educators did not talk about church dogmas as such, they alleged that their learners accuse them of being biased on some denominational matters. "*They tell me that I should talk about their*

religions as well." Textbooks for Religious Education are not readily available to both the educators and the learners and as a result the educators rely on the Bible as their textbook. This very obviously gives rise to a bias towards Christianity in their teaching. "*Sometimes when I give them a memory verse, some tell me that I should give them one from Koran*."

Freeman (1994:69) shows that educators and learners come to school with cultural biographies different from each other. In a multicultural classroom, eleven diverse cultures with different beliefs can be found in the same school. As one respondent said, "*some of the learners do not attend my lessons during the period of Religious Education, they say only Christians can attend."* Some parents go to an extent of instructing their learners to stay away from Religious Education.

It should not only be mere knowledge of different religions to be accommodated in the curriculum, but also teaching strategies and skills for teaching such a controversial issue as different religions. Moore (1994:254) states that a relevant curriculum should be sensitive to religions. The educator should be able to teach different religions such as Hinduism, Muslim, Bhuddism and many others. They should also be able to divorce themselves from teaching church dogmas. The aim and goal should also be able to develop a positive attitude in the educator towards other religions. The educator should also be able to instill values such as tolerance towards other religions in his learners.

It is further recommended that the different religions and cultures should be utilised as an enrichment of the learning experiences of all learners. The dominant trend should be;

- to work towards social solidarity by fostering inter-religious understanding
- to recognise that each learner needs firm support and respect for his/her religious background. The religious heritage of each learner is thus a firm base from which he/she can venture into an association with other learners.

Educators need to be made aware of cultural differences and similarities in order to understand themselves and to understand the people around them, because they are cultural educators (Soni 1997:17-19 and Krizmaric and Kolezaric 1994:47).

English as the language of teaching and learning

When we teach we are supposed to make use of English as well and these learners do not understand English and if you are found teaching them in Setswana or IsiZulu you get into a serious trouble. These are some of the problems experienced by educators. The learners are unable to take part in class discussions, because they cannot answer in English. "*Last week I sent out a learner to go and fetch a chalk. Instead of coming back, he went home. The parent phoned being furious and he demanded an explanation as to why the child was suspended, I was really dumbfounded."*

The content should include language across the HET, but also the knowledge and skills to address language problems and issues in the school curriculum. The cliché that every educator is a language educator has acquired a new validity in the light of the identified language problems that educator's experience. Student educators' own language skills in and knowledge of English should be developed, but they should also be able to address language issues and problems in their classrooms, irrespective of the learning area they teach. This means that the educator as a learning area specialist should be able to teach language across the school curriculum.

Condition of buildings and inadequate resources

Teaching and learning cannot occur in an environment, which is lackadaisical, unpredictable and not directed towards optimising quality classroom time. Conditions in the schools in which the research

was conducted were far from conducive to learning for substantial periods of time. Classrooms had broken windows, cracked walls, no doors for a long period, buildings were collapsing whilst those that were incomplete yet available were without roofs, which warrants classes to be called off during bad weather. For instance, it was a disaster during the heavy rainfalls in February and March 2000 when Mozambique and the Northern Province were flooded. Some classrooms became kraals and kennels for domestic animals. 23% of the school buildings were in an immaculate and excellent condition. (See figure 1.1).

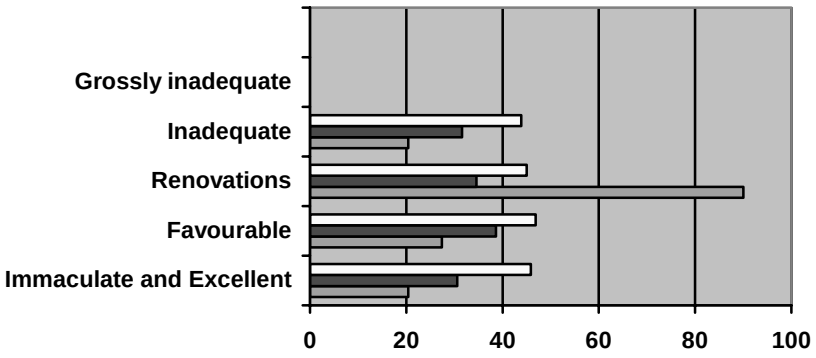

Figure 1.

An adequate shortage of teaching and learning materials deprives students from learning. The chalkboard was found to be the only dominant media used by most schools. "*In this school there is absolutely nothing and teaching is something that is no longer interesting. The only teaching aid an educator can rely on is a chalkboard.*" In some areas especially in the Northern Province there is no electricity. Often teaching aids such as overhead projectors are available, but cannot be utilised because there is no electricity.

Educators complained about overcrowded classrooms where large numbers of learners are gathered without an orderly arrangement. Abnormal ratios of an educator to 94 learners and even 1:120 in grade 8 were mentioned. In some cases, they have to teach under trees "*and I find it difficult for my learners to concentrate."* Educators pointed out that they do not check the student's work regularly because they find it difficult to handle such big groups and that they are not able to pay special attention to individual students. Some students are slow learners and they need the educator's attention in order to understand. "*All the time when I teach they fall asleep. It is difficult for me to identify the ones sleeping.* Educators are *also* frustrated because the government is not doing much about it."

As mentioned before, this category includes problems that can not be solved in the HET curriculum, but the aim and goal should be to train the student educators in such a way that they can still teach in the absence of basic facilities such as libraries, textbooks and teaching aids. The student educator should be skilled in the use of educational technology media such as overhead projectors cassette players, etc but should also be able to improvise and use whatever that is available. So-called low technology should be included in the curriculum. This simply shows that the use and manufacturing of a variety of media should be included in the HET curriculum.

There is also a shortage of other facilities such as libraries, ablution blocks, furniture and textbooks. (See figure 1.2) In a certain region, the whole school with 18 classes sharing the same duster. Grade 1 and 2 learners share chairs. The books used by most educators are outdated and they have nothing to do with Outcomes-Based Education. In extreme cases up to ten students share a textbook. Subjects like Physical Science, which require laboratories with apparatus, are taught theoretically, while the practical part is ignored. Students memorise the steps to follow in order to get some results. Although educators showed some dissatisfaction regarding the issue it has changed. "*The students' work is below standard where there is a shortage of these facilities.*"

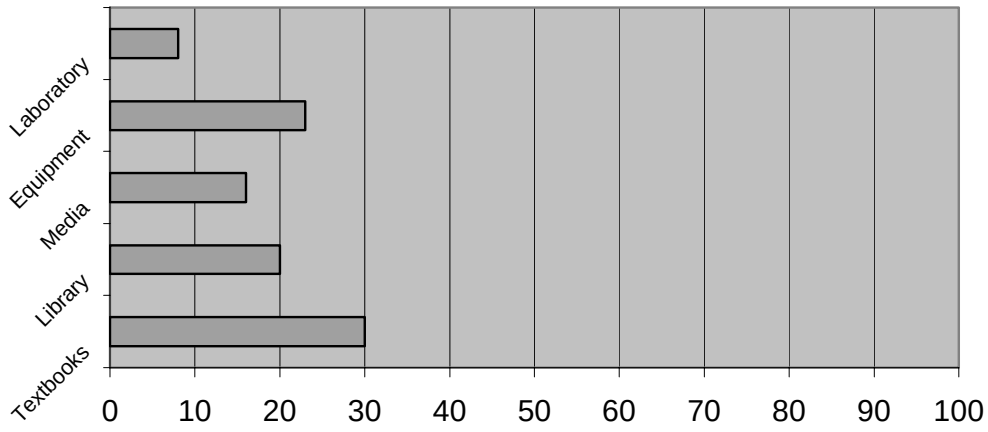

Figure 1.2 Lack of Resources

As highlighted earlier on, this category, too, includes problematic issues that cannot be addressed in the HET curriculum but the overall aim should be to train student educators in such a way that they can still teach effectively where basic facilities are grossly inadequate. The student educator should be equipped in the use of educational technology media such as computers, and many others, but should also be skilled in improvisation.

Lack of professional support

It is obvious that the educators are frustrated because of the lack of support systems**.** One respondent said "*the principal is always a problem because he is not supportive."* It was pointed out that where educators deserve to attend workshops regarding their day-to-day activities the principal is the only one who attends. In a certain primary school not even a single grade 1 teacher attended workshops regarding the teaching of Outcomes-Based Education (OBE). During class visits, he shouts at educators in the presence of learners. Although educators complained about it there is no reformation at all.

Sexual harassment of female educators seems to be common. Educators who refuse the principal's advances are punished: when timetables are issued, they do not have free periods and they receive class visits by the principal up to three times a week. His criticisms are destructive and he threatens to expel the educator. The principals seem unable to assist the educators with their problems because of various reasons: In some cases the lack of facilities were taken up with the circuit office, "*but even now we are still waiting."* When the problem of learners sleeping in class was discussed with the principal, he avoided confrontation with students and told the educators to *let sleeping dogs lie because they will fail at the end of the year*. He is not concerned about learners' future. One respondent puts bluntly when she said," *the principal is scared, he is not fit for this position."*

When the principal asked to take the matter further they refuse saying that they do not want to lose their lives. Educators are often scared of their principals. "*If he finds that I am criticising him, I may even lose my job. "*During one of the interviews, the principal of a secondary school insisted that he wanted to attend the interview and even started shouting at the interviewer. The interview then had to be terminated.

The lack of parental support is also obvious in a statement such as the following: "*I think there should be co-operation between parents and educators. Last time we asked him to call a parents' meeting he refused."* Parents sometimes orchestrate problems by opposing the educators in their duties. "*A parent will just come and peep through the broken windows and call a learner out." One parent once came with an axe in my class and dogs while I was teaching he came into my class without knocking and started shouting at his child who did not take the cattle for deep. It was pandemonium in the classroom."*

Once again the educators accuse the principal of incompetence when it comes to communication with the parents. Members of the School Governing Bodies (SGB'S) are also accused of fuelling problems for the educator instead of providing professional support. *"Some of the people that give us the headache are the SGB'S."*

This category seems to present a number of problems that fall outside the parameters of the HET curriculum. It is, however, possible to present some of these issues in the curriculum for HET. The aims and goals should include the empowerment of the educator in terms of knowledge of official support systems available to the educator. The student educator should learn about their rights as educators and how to address the transgression of these rights. Educators' legal aspects of the profession, interpersonal skills and professional communication with colleagues, duties and responsibilities for principals, parents and members of the SGB'S should be included in the curriculum.

Some of the problems could be avoided or minimised if the educators possess adequate interpersonal and communication skills. Where educators are illtreated, the matter should be taken to the educators' organisations or relevant government officials for further scrutiny.

Classroom discipline

Overcrowded classes giver rise to another problem, namely lack of discipline. Educators complain that they cannot control them because they are many. The students defy the educator' discipline and as such teaching is done in a haphazard way. A respondent commented, "*Bringing a child here is just a waste of time and energy."* The educators lost the students respect and what they say is taken lightly. Student aggression against educators was also pointed out. Students avoid punishment by being protective and defensive. When they do not like an educator they *boycott* classes and chant against him, so that he can be fired. In some cases they have him expelled from school. "Having different age groups in one class creates problems. Older students do not want to co-operate. They question the educator's authority and they are also bullies." Classroom management skills, different methods of organisation, control and maintaining discipline, should be addressed in a curriculum for HET. A curriculum for HET should be aimed at teaching the student educator different strategies for handling big groups. The student educator should be required to demonstrate their skills in handling larger classes. Various didactical strategies, skills and techniques in handling larger groups of learners, control and maintaining discipline, methods of organisation and various age groups' teaching in one classroom should be included. Group work and team teaching is strongly recommended for such classes. Where possible a principle of individualisation should be administered, as one of the key principles of OBE is continuous assessment.

Discussion and Conclusion

From the foregoing discussion, it is evident that the following considerations apply to all the categories of problems that should be addressed in the HET curriculum. Student educators need to acquire knowledge about aspects such as diverse religions, teaching strategies and techniques, English as the language of teaching and learning, improvisation and proper use of media and technology. The learning experience of HET, as provided by the curriculum, should however, also include practical demonstrations by the students as proof that they have mastered the required skills and strategies.

The intensity and diversity of the problems that await an educator in the classroom, necessitates practice directed learning experience in the curriculum. This does not imply lip service to the traditional approach to HET but a new focus on learning experiences. Learning experiences should be extended to include extensive practical experience in schools and the interaction between the college or university as an institute for teacher training and the school as the career focused arena should be utilised to its full potential.

In conclusion, although the problems that South African educators experience have been categorised into separate groups, these categories are interrelated and the one can not be addressed while the others are ignored. Although the focus of this research was determined as the curriculum for HET, some of these problems fall outside the parameters. Lack of support system for the educator, as well as the lack of resources cannot be addressed in the HET curriculum. The fact that an urgent need for in-service training courses for principals exists cannot be addressed in this report. However, if it is assumed that these problems will exist for a couple of years to come, it seems unavoidable that an attempt should be made to address these problems in a curriculum for HET. The alternative to wait until such facilities are available before the educator is allowed to teach is simply not feasible.

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E-TRAINING TEACHERS IN RURAL AREAS THROUGH SATELLITE

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Introduction

This paper describes the experiences and first findings from the implementation of the ZEUS (Satellite Network of Remote Schools) project, which aims to show how good-quality distance e-training, enriched with broadband applications, can be delivered to teachers working in multigrade schools in remote areas of Greece, overcoming the deficiencies in terrestrial telecommunications infrastructure through the use of satellite telecom systems. Following some initial background information on rural multigrade schools and the increased need of teachers working in them for in-service training and support, the concepts and tools of the ZEUS project are presented as a response to the challenges posed, and are followed by a discussion of first findings and conclusions.

Multigrade schools: the 'borderers' of the education system

In many primary schools of the Greek provinces there is not one teacher available for each of the six grades: the low number of students statutorily justifies the employment of less than six teachers –even of one or two–, who nevertheless are expected to cover the needs of a full school. These schools, known as multigrade schools, fulfil a function of national importance, as they provide the children of remote and less accessible areas with the access to education which all children of Greece are entitled to.

Teachers in multigrade schools: need for, and obstacles to, continuous professional training

Teachers of multigrade schools are confronted with significant challenges. In particularly promiscuous classes, they simultaneously teach two or more age groups and possibly more than one subjects. Teachers' initial professional training does not suffice: indeed little if anything about multigrade settings is included in the formal preparation of a teacher. The need for continuous training becomes evident – especially in the light of the fact that typically inexperienced, newly-appointed teachers are posted to remote schools for a short term service.

Providing teachers from remote areas with in-service training is not easy. A teacher's round trips between their remote school and an urban training centre tend to be costly, if not virtually impracticable, given that there may not be a colleague available to replace them during their absence.

At the same time, teachers at remote schools suffer the consequences of the digital divide between rural and urban areas. Broadband access to the technologies and services of the Information Society still remains unachievable for the inhabitants of remote and less accessible areas with deficient telecommunications infrastructures.

Greece: a case reflecting international trends

The above described difficulties of multigrade teachers working in remote areas are not unique to Greece. Internationally, the shortage of teachers in rural and remote areas, and the weaknesses of the education systems in the provision of training and professional support to these teachers, have been well-documented in the literature – particularly with respect to rural districts of the USA and Australia. Forbush & Morgan (2004) point out that shortages of teachers in rural communities relate to problems with recruitment and retention endemic to rural areas (Helge & Marrs, 1982). Among

such challenges one may identify social and cultural isolation, limited mobility within the system, lack of personal privacy, diversity-related issues, and other issues (Ludlow, 1998; Miller & Sidebottom, 1985). With reference to less-developed countries, too, Ankrah-Dove (1982) provides a similar account of the problem, and suggests that four interrelated features of contemporary teacher education programs should be developed if good teachers are to be attracted to and retained in remote rural schools: field-based preparation, teamwork in training, community support of training and the recruitment and preparation of local teachers. Coldevin & Naidu (1989) also provide an interesting view to issues relating to Third World development through in-service teacher education at a distance.

Multigrade teachers' pronounced need for in-service training is also particularly highlighted. Benveniste & McEwan (2000), analyzing conditions under which implementation of multigrade schools might be successful, identify the lack of in-service training as a major constraint to the implementation of educational innovations in multigrade schools. Most interestingly, they conclude that capacity building through in-service training is an important determinant of the way teachers approach their task.

All these problems appear to be in sharp contrast with a growing recognition of multigrade schools as not only a necessary, but indeed a good-quality option for education systems. Multigrade settings are believed even to have some advantages over single-level classes, arising from the interaction among children of different ages and abilities and the powerful social development and learning dynamics generated by this. Cook (2000), for instance, describing her experiences in a small school in rural, central west New South Wales (Australia), stresses as positive points community and parent involvement in the school, the benefits of multigrade classes, the close relationships of students and staff, and extracurricular activities. As Lloyd (2002) points out, research on classes that are mixed age by choice, not merely multigraded, has found positive effects on student achievement, mental health, social development, and liking for school. Multi-age classes generally have more parent support, but teacher continuity is also necessary for success. Indeed, such recent trends in education as peer tutoring and project-based learning have always been practiced in small rural schools (Boss 2000).

The use of ICTs

The need to support multigrade education thus becomes obvious. As a response to the obstacles described earlier, the use of different forms of technology-supported learning and distance education models have been advocated for the enhancement of quality and accessibility of teacher training programs (Squires, 1996). Distant delivery of instruction through the use of technology has appeared to be a viable approach for addressing the problems and issues associated with providing effective and efficient teacher training in rural areas (Ludlow, 2001). The literature reflects this focus on the role of technologies enabling distance training of remote teachers, generally following the technological trends in the field of computer-supported learning. In the early 90s Kendal (1992) offers an appreciation of the benefits of a computer-based telecommunications network used for delivering telementoring and teletraining for educators in rural areas. Ludlow & Duff (2002) describe the use of webcasting technology in a personnel preparation program for rural special education practitioners. Falconer & Lignugaris-Kraft (2002) report on the use of two-way conferencing technology for the provision of teacher training in remote areas, while Forbush & Morgan (2004) focus on delivering two live internet-based real-time video and audio teleconferencing courses to special education teachers in rural areas in the USA, which they claim has successfully overcome some of the training obstacles inherent to rural school districts, including access to skilled trainers, college/university training, and quality curriculum. Generally, the content of training delivered via the different technologies to the remote rural teacher varies greatly, from conventional seminar-type lessons to more imaginative uses of technology-enabled remote access, such as classroom observations at a distance (McDevitt, 1996).

Importantly, however, beyond technological concerns and novelties, international experience has also pointed out the importance of an adequate strategic and organizational framework, such as the one reflected in the direct outreach of universities and teacher training providers to the rural areas, and the development of university-school partnerships, which are believed to help alleviate isolation and the several disadvantages (e.g. Menlove & Lignugaris-Kraft, 2001).

Building the Knowledge Society without discriminations through satellites

Knowledge is a fundamental and strategic resource of society. In recognition of this, the European Union aims at becoming a truly knowledge-based economy, to enhance the quality of life, the working conditions and the overall competitiveness of its industries and services. To achieve these objectives, widespread availability and usage of broadband and high-speed Internet throughout the EU is necessary. It is becoming more and more evident that the vision of Lifelong Learning and 'Education for All' will be realised through 'Broadband for All' (cf. for instance Scottish Executive's recently launched –in May 2005– 'Broadband for Scotland's Rural and Remote Areas' initiative).

However, the digital divide in Europe remains large, and for more than fourteen million European households in remote areas the digital divide is actually growing. Teledensity is lower outside urban centres, and the rural and less favoured regions lack the same access and supply of internet access and broadband connection as the urban areas have. It is estimated that more than thirty million people in the Community inhabit remote rural areas, which account for some 30% of the territory. The proportions of rural populations living in geographically disadvantaged areas and suffering from the digital divide are significantly higher in the new Member States and accession countries, which results in significant socio-economic effects and challenges (Cohendet 2003).

It is a stated strategic priority for Europe to use to the full the potential offered by all available broadband technologies, including satellite communications, to bridge the digital divide (European Commission 2003). Satellite telecommunications can indeed play a crucial role in the creation of a balanced Knowledge Society without discriminations, as they can secure broadband access to the Information Society for those who geographical and other adversities have kept in digital isolation. In recent years there have been several initiatives in the field of satellite telecommunications applications addressing the needs of rural communities. As Cartheron (2003) shows, under certain conditions, satellite solutions prove competitive among other broadband access technologies, for the reduction of the digital divide in Europe.

Distance education: a case for satellite telecommunications

Distance education is one of the major fields of application in this area. Littman (2000) describes satellite telecommunications as an innovative delivery option for distance learning, and offers an account of different educational initiatives that facilitate access to new student populations in distance locations, sustain trans-border collaboration and research, and promote curricular enhancement and enrichment. Significant experience has already been gained internationally, particularly in the United States and in Australia, where e-learning via satellite networks has been tried mainly for adult learning, but even with children in primary education (e.g. Boverie *et al*, 2000; Boylan, Wallace, & Richmond 2000). In the last couple of years many other less developed countries with populations distributed over large geographical areas have been exploring the potential of satellite telecommunications for e-learning. Al-Sharhan (2000), for instance, discusses the developments in satellite communications and educational applications, with a focus on the possibilities of adapting satellite technology for instruction in developing countries, and recommendations for the adoption of satellite technology in Saudi Arabia. Cohen (2002) describes how the University of the South Pacific has created a satellite-based computer network aimed at greatly expanding its offerings to students on remote islands. Interestingly, also, from an international perspective Lorenzo (2002) describes the Global Development Learning Network (GDLN), a satellite-driven global communication system developed by the World Bank to help developing countries fight poverty and share in a global exchange of information, through Distance Learning Centers that are used by private and public organizations and institutions for distance education and knowledge-sharing programs.

ZEUS' response to the challenges: a high-quality learning environment over satellite

This growing mass of international experience clearly demonstrates that emerging technologies offer promising solutions to the challenges of providing accessible and appropriate training to rural educators. Making this its central concept, the ZEUS project has come as a mature cooperation

between technological and pedagogical experts, who have joined forces to offer a genuine response to the above-described challenges through the provision of distance e-training for multigrade school teachers via the use of broadband satellite networks. The recent launch of the Greek satellite, HellasSat, has given ZEUS an excellent opportunity to highlight the existing potential for the provision of state-of-the-art e-learning in remote and less accessible territories of Greece.

The project has provided educationalists and technologists with an interdisciplinary collaborative framework for the development and exploitation of an advanced, content-rich e-learning environment based on satellite telecommunications. Synchronous and asynchronous e-learning technologies delivered over broadband satellite internet have been integrated into a unified e-training framework, which has been designed and developed based primarily on pedagogical rather than technological grounds. The output of this procedure, and main deliverable of the project, is a distance in-service training programme, which was piloted with multigrade school teachers in diverse remote and disadvantaged locations throughout Greece.

The ZEUS training programme

Based on analysis of teacher needs, that was conducted at the outset of the project through the administration of questionnaires completed by multigrade teachers as well as through literature research, the ZEUS training programme aims at helping multigrade school teachers to develop their professional skills along two main axes:

- Use of ICT in their work, both for teaching/learning and administrative purposes.
- Application of teaching and learning approaches which are most appropriate for the multigrade classroom, with some special interest in the advantages that cross-curricular approaches can offer.

Through satellite/ICT installations at schools delivered by the project, the training programme has become available to teachers at ten locations in the extremities of Greece: Thrace in the Northeast, Pindos mountains in the mainland, the Aegean Sea, Crete, Southwest Peloponnesus, and the Ionian Sea. The selected pilot sites reflect the diversity of conditions and circumstances in which a remote school may be found to operate in Greece. The sample includes schools from mountainous communities with little interaction with the rest of the country, to other disadvantaged rural areas in the mainland, and to schools located on islands which, although tourist destinations in summer, revert to being almost isolated territory during winter.

Technological environment

The ZEUS e-learning environment is based on technologies which exploit satellite telecommunications for broadband delivery of rich educational content, including good quality video, ‘heavy’ web-based applications, exchange of large files, multipoint conferencing, etc. Due to some limitations in the technological possibilities offered by the Greek satellite at the early stages of the project, the architecture of ZEUS (DVB – Digital Video Broadcasting) foresees the use of broadband satellite links for downloading data to user workstations, while uploading and feedback is sent by the user through existing terrestrial infrastructures (typically ISDN lines, available to virtually all schools). It is noted, however, that recent developments in the telecoms market in Greece already allow for two-way broadband satellite connections (DVB-RCS – Digital Video Broadcast – Return Channel Satellite).

The applications mainly used for the delivery of training are: a) the MENTOR software, a synchronous e-learning suite developed by the project partner by Intracom S.A., which is specifically designed for use over the satellite platform, and which supports videoconferencing, application sharing, and chatting, all integrated in the same interface; and b) a specifically designed asynchronous e-learning environment, a dedicated web platform developed within the project, which provides secure and structured access to a rich pool of educational content.

Focus on pedagogical design

Although technical specifications do play a crucial role in a distance-education-via-satellite scenario, the success or not of the effort mainly depends on the underlying pedagogical design. Literature offers ample evidence for this. Lim (2002), for instance, underlines instructional strategies and instructional design as factors which affect students' higher learning and application of learning in a satellite-based delivery setting. Taking the primacy of a rigid pedagogical design as a rule, ZEUS has produced a training programme which aims to cater for flexibility and guidance, interaction with others and self-paced learning.

To this end, a central event has been put in place for each lesson. This is a live videoconferencing session, using the synchronous e-learning suite, which covers the need of isolated teachers for communication and real-time interaction with colleagues and instructors. The importance of interaction is similar settings has been stressed in the literature, as it has been found in connection with program effectiveness and particularly with the levels of cognitive, affective, and behavioral acceptance by the learners of programs delivered via satellite (Shrestha & Sutphin 2000).

Both before and after the live session, however, the pedagogical approach adopted by ZEUS foresees learning activity which takes place independently in the working environment of the teacher trainee. Through the use of web-based instruction techniques applied in the ZEUS e-learning web platform, course participants are offered on-the-job training opportunities through tasks and materials that allow them to work at their own pace, interact with the instructor and other practitioners as needed, and receive individual feedback as they apply information to their classroom settings. For each lesson, there are introductory information on the topic covered, preparatory activities, the outcome of which is then reported by participants in the web environment and during the live session, as well as post-session consolidation and conclusion activities. The broadband link permits the use of large-size files (e.g. video clips).

Evaluation methodology

One of the major aspects of the ZEUS project is the evaluation of the piloted solution for e-training multigrade school teachers via satellite. The aim of evaluation is to assess the appropriateness of the choices made during the design stage of ZEUS, and the overall effectiveness of the solution, at three levels:

- at the level of the technology used (user-friendliness, functionality, reliability, efficiency);
- at the level of the content of training offered (structure, completeness, clarity, variety; attractiveness); and
- at the level of the procedures followed (planning and organisation; educational methods; implementation).

The views of users (teacher trainees and instructors) on these aspects of ZEUS are collected through a variety of tools, including online questionnaires, interviews, as well as field observations and video recordings in the schools and classrooms of the participating teachers. Questionnaire responses are analysed statistically, while data from the interviews and observations are analysed qualitatively, making use, among other tools, of specialised software for the demarcation and analysis of video data.

For evaluation purposes, as well as for the introduction of improvements at a middle stage of the implementation, the course offered is organised in two consecutive cycles. As a result, evaluation activities cluster around three main points in the timeline of the project: before the outset of the course, after the completion of the first cycle, and after the completion of the whole course, at the end of the second cycle. In this way, the evaluation methodology seeks to take record of the conditions prevailing in the participating schools before the programme, after its first cycle, and after its eventual completion, so that any changes effected by ZEUS can be spotted and hopefully interpreted. In particular, the outcomes of evaluation at the end of the first cycle are useful for the introduction of any necessary improvements in the second cycle.

Initial findings

As the ZEUS project is currently approaching its completion, there are already some interesting findings and conclusions that can be reported at this stage. These will naturally be further enriched when the analysis of the significant amount of collected quantitative and qualitative data is completed. In the following lines, some of the most important research findings, as well as some more general appreciations of the experiences gathered during the project, are presented.

The attitude of the participating teachers towards the training programme has always been very positive. In their majority, they have been dedicated to the course, and prepared to withstand any difficulties arising out of technical or other problems. According to the views expressed by the teachers of the remote schools, this interest in ZEUS is due to such factors as a decrease in their feeling of isolation and increased opportunities for communication with colleagues, new opportunities for access to up-to-date information, as well as the good relations and rapport developed between the trainees and the staff supporting them.

In addition, given the situation recorded by ZEUS before the beginning of training, multigrade school teachers in Greece are in real need for training in the use of ICTs, as well as in new, less conventional pedagogical approaches, which would help them better respond to the particularly high demands and challenges posed by multigrade classrooms. All observations made in schools at the pre-course stage revealed a very low level of use of ICTs, as well as traditional methods of teaching and classroom management that did not appear to offer best solutions for the particularities of the multigrade classroom.

Concerning training content, too, the experiences of ZEUS has shown that rural teachers' training in the use of ICTs can have effects reaching well beyond the school, proving to be a useful tool for boosting local development. The central position of the teacher in an isolated community, and the significance and prestige of the school as one of the few public establishments, can be used in an attempt to instill a new culture in rural communities promoting digital literacy and reducing resistance to the use of new technologies. Trained, knowledgeable teachers can act as the change agents who will disseminate the new potential offered by ICTs and encourage its uptake by the local workforce.

Another very clear outcome of ZEUS was a corroboration of the predominance of the appropriate pedagogical design over mere availability of new e-training technologies via satellite connections. The different media, tools, and contents need to be orchestrated, according to clear pedagogical planning principles, into frameworks enabling substantial learning experiences and maintaining learners' interest unabated, so that specific training goals and objectives are achieved. The analysis of data so far has shown that clearly a specific procedure can be proposed for the preparation, realization and support of e-training, which structures a series of asynchronous preparatory, connecting, and consolidation activities around a central live session.

As far as technology is concerned, the ZEUS experience has clearly shown that satellite data telecommunications can effectively support the provision of training and professional development at a distance, particularly to professionals such as teachers who work in remote and isolated areas. Nevertheless, ZEUS has also clearly indicated that significant technical difficulties, which in some (limited) cases even caused obstacles to the smooth running of training, would have been avoided if a more advanced model of satellite internet provision (DVB-RCS) had been available, not demanding the use of non-broadband terrestrial infrastructures.

Overall, running ZEUS has been a rewarding experience, which, on the one hand has confirmed the usefulness of satellite telecommunication systems for the development of remote and isolated communities, starting from teachers working in such communities; and on the other hand, has suggested ways for introducing improvements into, and furthering our work in this field.

Note

More information about the ZEUS project can be found at www.dias.ea.gr. The ZEUS project is partially funded by the General Secretariat for Research and Technology of the Greek Ministry of Development, within the Concerted Programme for Electronic Learning of Measure 3.3 of the Operational Programme Information Society (Community Support Framework 2000-2006).

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THREE EXPERIMENTS TO ORGANIZE VIRTUAL TEACHER EDUCATION AT THE UNIVERSITY OF HELSINKI, FINLAND

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Abstract

This paper consists of a description of three experiments to apply ITC to Textile Teacher Education at the University of Helsinki involving six other universities in different parts of Finland.

The experiments were focused mainly on the course management and technical features of university education and less on the pedagogical or social aspects. In the first experiment the aim was to establish flexible lecturing independent of time and place. As the consequence of a four cycle action research-project, a promising blended course model was developed, which can be available e.g. for students' home computers. The second experiment consisted of a case study where research seminars were organized over the Internet between distant locations. The aim was to find a way to conduct synchronous research seminars online and compare that with an asynchronous one over a virtual platform. It was found that the students preferred the latter, asynchronous model. The third experiment consisted of instruction of textile techniques. For this reason a fabric collage course was designed. The course was studies for pedagogical and technical usability. It was also found that it is possible to study and learn textile design techniques over the Internet either individually at home or even if the groups of students are distributed in different locations.

With these three experiments, it can be shown that management and controlling of technical features in teaching functions needed to educate textile teachers are possible virtually if lecturers are willing shift their traditional roles into those required in web-based instruction

Introduction

This paper describes research-based development in a virtual university project (Networked University of Craft Science and Craft Education) designed to apply information and communication technology for distantly distributed education in the control of the University of Helsinki, in Finland. This research project presents a part of the Finnish ICT strategy of education and research. The project has been financed by the Finnish National Ministry of Education during the years 2001 – 2006 and it is still going on. Through the whole project until now, six different Finnish universities have participated in the project in different locations of the country.

In the beginning of the project it was established that in the sciences involved, three forms of teaching were dominating: lectures, research seminars and knowledge and skill based courses for textile design techniques. This paper consists of descriptions of the experiments, development and conversion of traditional intruction into digital form. The first study was designed to arrange complete lecture courses and to provide necessary teaching materials for the students over the Internet independent of time and place (Kaukinen & Kaukola 2003; Collanus & Kaukinen 2004). The second study, a shorter case-type experiment was constructed to conduct research seminars for participants and the teacher in different locations and the third model was directed to teach textile techniques over the Internet (Collanus 2003).

The roles of an online instructor can be examined from four different perspectives, from the pedagogical, social, managerial and technical roles (Berge 1995; Maor 2003). In this paper the focus is based mostly on the managerial and technical roles of the instructor, since in the initial stages of the development of online courses these problems have to be solved first in order to get the project started.

The theoretical background of the article is mainly based on organization and planning of the online course. Organization of the online course includes concepts such as a university without walls; transition of the student element that generates pressure to create flexible possibilities for learning and teaching; and the shift in the distribution of work caused by information and communication technology (e.g. Cornford & Pollock 2003). The online course's planning includes concepts like the computer as a teaching, learning, communication, and working tool; open and flexible virtual and dialogical learning environments, which include places for the information, communication, and interaction between students and between the teacher and the student (Tella 2001; Tella *et al.* 2001).

The first case - Online lecturing

The first experiment consisted of an action research study in four cycles including two different blended online courses. Both courses applied a supportive WebCT virtual platform over the Internet and the lectures were given initially by video conferencing. Also both courses were carried out two times: *Introduction to Craft Science* in autumn 2001 and 2002, and *Foundations of Textiles and Leather Technology*, in spring 2002 and 2003. The first course was taught by seven lecturers and participated and passed by 84 students. The second course was taught as well with seven lecturers, and participated and passed by 65 students. (Kaukinen 2005.)

The research problems developed during the action research were as follows:

- How could a virtual lecture course be arranged between several universities?
- How could the use of video conferencing be improved?
- How streaming technique can be considered?
- How could storing and using lectures be improved?
- How did different actors experience the blended virtual lecture course?

In this study the different research cycles were easily separated, that made possible the making of clear designing, activity, observation, and reflection cycles, because each course were a cycle of its own. (Kaukinen & Kaukola 2003.)

The data collection of the study was done with open questionnaires from the teachers, technical staff of the participating different universities. The students answered the network-based questionnaire with open and specified questions. Also all of the given video conference lectures were observed by the researcher, who kept a diary of the events during the lectures given. All data was analyzed using content analysis method. (Kaukinen & Kaukola 2003.)

As a conclusion from the research results, it can be inferred, that synchronous video conferencing technology is not very suitable in instructing conditions, which require a high level of student's concentration to perceive and assemble a complexity of knowledge. Most of the problems posed with video conferencing technology were technical – in addition the maintenance of connections required the presence of too many persons. The workload of the lecturer increased because of the time needed to coordinate and supervise all of the necessary functions well in advance. (Kaukinen & Kaukola 2003.)

If video conferencing technology seemed to be impractical, then the experiments with asynchronous or one-way lectures appeared to be promising. The problems of video conferencing were conquered with the lectures which were streamed, videotaped, and processed in a lecturing program. But when lecturing in an asynchronous way, the lectures became easily to too compact, because they lacked the normally occurring slowing down elements, that allow the brain of the student to assume and restore knowledge. That is why the asynchronous lectures had to be split into smaller sections. (Kaukinen & Kaukola 2003.)

This case has shown that the instructor's technical role can grow too large, so that it is impossible to manage with online technology without the presence of supporting technical staff. But when better ways of carrying out online lecturing were found, the teacher can focus on more relevant issues in

teaching. The managerial role's transition can be discussed by the differences of two online lecturing ways. While video conferencing, the teacher had to manage with different locations in the online live situations, which can create much confusion, when trying to keep technology and the course in the intended direction. But with the asynchronous way, the instructor has more time to focus her energy on the course structuring and planning so that the lecture is once ready made.

The second case – Development of an online research seminar

The aim of this part of the project was to find solutions of conducting research seminar session online where the instructor and the students are situated in different locations. The solution had to be synchronous, two-way, so that it would be possible for the teacher and the students to meet face to face in a real time set up. This part of the study had been initiated from an idea that the teacher could stay at her office and the students in an adequately equipped distant classroom. This course was also managed with the help of a WebCT virtual platform. It allowed e.g. scheduling of sessions, a discussion area and distribution of research papers in process to all participants of the course. It was also possible to provide important links such as library searches, methodology links etc. in WebCT. The research seminar sessions at the point of the study represented the latter part of the research seminar course, where the research papers are nearly complete and they still needed to be evaluated individually before being completed and handed over for final assessment.

In a session (90 min) the student presents first her research papers consuming approximately 20 min. After this representation feedback of the research paper was to be given by both the students and the teacher, who sums it up and finalizing all the given comments. This could be done with open face to face discussion online, by discussion in pairs or small groups, results of which were share and evaluated with all participants in open discussions face to face. It was also a prerequisite that all session participants have read the full paper distributed in the WebCt in advance.

The research design for this reason was developed in four different teaching arrangements. Three strived at synchronous, face to face contact, one only for comparison, was arranger asynchronously with no face to face contact, only with literal communication over WebCT. The examined arrangements of the seminar sessions were as follows:

- Videoconferencing applying the Polycom PVX-program online from the teacher's office. The students participated in a distant classroom with real time face to face online contact.
- Normal videoconferencing arrangement. Both, the teacher and the students in different, distant classroom locations with real time face to face contact.
- Normal videoconferencing arrangement. The teacher and a part of the students in one location, the rest of the students at a distant location with real time face to face contact.
- Three-phase literal communication over WebCT-platform, no face to face contact. First a student makes her research paper available for all participants in WebCT on an assigned date. Next all fellow students give their remarks on the discussion area on an assigned date. In the final stage the teacher makes a written evaluation of one A4 with comments and recommendations on an assign date.

The research problems were established to gather information on these four different teaching arrangements.

- How was it possible for the student to give her research paper presentation?
- How was the interaction experienced during the seminar?
- How successful was the pair or group work during the seminar?
- What else can you tell about the contact (Polycom-PVX session, video conferencing sessions, literal seminar session?

After each session data of experiences was gathered from the teacher's diary and from the students with an open questionnaire after the whole course was completed. The collected data was analysed with content analysis method.

As conclusion it can be gathered that a research seminar course can be conducted successfully virtually. Synchronous seminars independent of connection showed that, though face to face contact was possible, that the technology applied, was not developed enough to supply sound without delay and use of additional microphones in the classroom which developed abnormal communication and lost information. Especially for the instructor lack of accurate facial image and view of all the participants simultaneously caused that the refined sensitivity which is necessary in social situations was not possible and thus a considerable amount of pedagogically important situations were lost.

The students found the three-phase literal seminar sessions very effective. They felt that they received an excellent evaluation of their papers, better than ever earlier. There was freedom and flexibility. The students wished, however, that there should be more communication between the fellow students in the web discussion. From the teachers point of view the literal seminar session added the workload and responsibility, but that it can be tolerated due to the better quality of research achieved. Despite the positive features of the three-phase literal seminar, the students felt that they would still prefer traditional seminars where they could additionally get acquainted with their instructor and the fellow students.

The third case - Learning skills virtually

The third experiment consisted of teaching textile technique skills over the Internet. This case study was done by creating a digital *Fabric Collage* –technique course, that was carried out twice, autumn 2002 and spring 2003. The course was designed within the WebCT virtual platform. The main objective of the course was to get acquainted with the fabric collage -embroidery technique. Teaching and studying in the course was synchronous time-wise and intensive. As a researcher Miia Collanus (2003) was a participant in the course and collected data aiming at describing what pedagogical usability means in the context of craft skills online learning. (Collanus & Kaukinen 2004.) The theoretical background of this case is based on usability, which can be divided to technical usability and pedagogical usability. Technical usability includes interface design and functionality of a product (Mäntylä 2001). Pedagogical usability, instead, referrers to the correspondence between the system's design and the educational environment, and the context in which the learning material will be used (Hakkarainen *et al.* 2001).

The data of this study was collected by videotaping students while they made their course exercises, and as a secondary data they answered to two questionnaires. A think aloud –method analysis was used while videotaping students. The data was analyzed with both the think aloud protocol analysis and analysis of the actions seen on the video material with the help of Transana™ computer program. The questionnaire data included mostly positive feedback about the course from the students, and the video data reinforced these results. (Collanus & Kaukinen 2004.)

As a conclusion of the research results, it can be said, that the students' thinking evolved around orienting mental images of the beginning of the process to the end's operative mental images (see Hacker 1981, 79-81). Therefore this case suggests that web course designers of craft should pay particular attention to the construction of the first mental images created by the learning material, because these tend to follow along through the whole process. In general, learning skills virtually is possible (Collanus & Kaukinen 2004), and therefore also positive feedback from the students gives motivation to continue such developmental work as this. The results of this case study also shows that this kind of courses for studying craft processes needs much time for planning and designing. The course organization needs team work, so it is important that everybody involved is motivated in developing online instruction. (Collanus & Kaukinen 2004.) According to this case it can also be seen e.g. that the teacher's social role can be broadened to the pre-course designing work in the team.

Conclusions

The courses mentioned in this article are still in use. The lessons learned from these courses are mostly encouraging, and the developmental work is going on. In the case of the instructor's roles, it stands to reason that at least two of the instructor's roles will be in transition when engaged to online teaching. For example the managerial role evolves more around strict course planning in advance, and the technical role evolves around technical support staff with a competence to solve problems faced by the students. It seems that the technical role grows far too broad in synchronous online situation as compared to the technical role in the traditional classroom instruction.

The next step in research in the project will be the investigation of the transition of the instructor's roles online. In the introduction of this article there was referred to the online instructor's role concept of Berge (1995) and Maor (2003) and this article approached of the researches rose from considerations mostly on managerial and technical roles of the instructor. As a future action we shall interview the instructors of these online courses this autumn in respect of Berge's/Maor's instructor roles, being: 1) pedagogical, 2) social, 3) managerial, and 4) technical. Revealing the clear role shifts of the instructor has significance in developing teacher education in general and specifically at university level.

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EXPERIENCES IN INITIAL AND FURTHER TEACHER EDUCATION IN AN eLEARNING ENVIRONMENT

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Abstract

Despite the fact that entities in charge of school education have put some effort into improving the technical infrastructure in German schools, the use of ICT in the educational process is still very unsatisfactory, mostly due to the insufficient ICT competences of teachers.

In order to provide these teachers with ICT competences, FIM-NewLearning at the Friedrich-Alexander-University, Erlangen-Nuremberg, has developed, tested and evaluated the *first eLearning training* for in-service teachers and student teachers in Germany. The training aims at the integration of new media as a supporting tool for all teaching activities. The participants learn and practise in a virtual environment; they are organised in small groups and each of these groups is headed and supervised by a specific tutor. The training contents are basically offered in application-based and project-based form and are specific to the different teaching subjects.

In the last three years, over 760 participants have successfully attended the training, providing a wide range of experiences concerning the integration of virtual learning environments in teacher training.

Initial and Further Teacher Education in a eLearning Environment

The project eL3- eLearning and eTeaching in initial and further teacher education, a BMBF[1]-funded project.

Since summer 2001, FIM-NewLearning at the Friedrich-Alexander-University, Erlangen-Nurenberg, has been developing and testing a web-based training system for in-service teachers and student teachers.

Over 760 participants have successful attended the training, providing a wide range of experiences.

Background

FIM-New Learning, the Institution

FIM-NewLearning, the coordinating partner, was created in 1976 and has been involved in the development and implementation of network-based learning systems for about 10 years, regarding all components like content, support, technology, organisation, evaluation in a lifelong learning perspective. This involves a broad range of target groups, from young adults to senior citizens. FIM has an interdisciplinary team of about 50 people, including a technology lab which develops, mostly in an open source context, e.g. data base applications, learning environments, communication environments, specific user interfaces. FIM has been coordinating European projects for more than 15 years.

[1] Bundesministerium für Bildung und Forschung – German Federal Ministry of Education and Research

The Situation at German Schools

Despite the fact that entities in charge of school education in Germany have put some effort into improving the technical infrastructure in schools (98% of the German schools have Internet access, BMBF[1] 2004), the use of ICT in the learning process is still very unsatisfactory. Approximately 35 % of all teachers in Germany (> 700,000) do not use a computer for teaching or the preparation of teaching material, only 30-40% % use computers in the classroom and less then 30 % use the Internet in the classroom (Estimated by Federal educational administrations, 2004)

The low level of ICT use in classrooms is a matter of insufficient competencies in the field of ICT on the teacher side. On the one hand, this situation is due to insufficient traditional teacher training and inadequate ICT training at university level. On the other hand, the public pressure regarding the use of ICT in classrooms is extremely high. Especially older teachers experience a high level of stress in this respect and have an urgent need to overcome the feeling of being outdated and in a position inferior to that of their own. The pressure on teachers is very high indeed. Furthermore a high number of teachers using ICT at present for their teaching claim that their skills and concepts are based on an autodidactic, non-systematic learning approach, leading different times to uncertainty and time consuming trouble shooting when using computer and internet resources.

The Project "eLearning and eTeaching in initial and further teacher education"

Two different approaches have been chosen to implement the training. The training testing and validation comprises the use of the same WBTs in two partially different eLearning environments.

- In service teachers and student teachers from two different German Bundesländer (Bavaria and Lower Saxonia) distributed at different schools and Universities participate in the training. Peer groups were built according to the school type and teaching subject (but in most cases not according to a certain school, due to low participation of learners from a specific school). These peer-groups (8-12 participants) were as far as possible built according to the regional distribution of the participants. Each peer group was supervised by a tutor. This project – eL3 – project started in January 2001 and has been funded by the German Federal Ministry of Education and Research with a total budget of 2.39 million EURO.
- In the second approach in co-operation with the city of Nuremberg the peer groups were organised according to the school they belong to. Small peer-groups (8-12 learners) within a school under the supervision of a tutor were built. This project – VirTUS – started summer 2004 and finished May 2005. The evaluation of the project is not finished yet; it will be finished by September 2005.

The projects are an attempt to introduce and improve the use of ICT in schools. The training aims at the integration of the computer as a support tool for all teaching activities.

As a minimum, teachers develop basic competences regarding ICT in a subject context involving:

- Office applications (Microsoft Office and OpenOffice)
- Use & evaluation of web resources and educational software
- Production of web content
- Production of multimedia content
- Communication and cooperation tools

[1] Bundesministerium für Bildung und Forschung - German Federal Ministry of Education and Research

Learner profiles

Who is the learner participating to the training?

He/she is an in-service or student teacher with no or little previous experience of eLearning. In most cases, he/she has very little experience with ICT.

The target group is used to working and learning independently and individually, is well motivated and has very high expectations concerning the use of ICT for teaching.

One important aspect to consider is the technical equipment on the learner side, which is frequently a low-performance computer system with a low-speed connection to the Internet.

Key Aspects

Developing a learning system with focus on the learner

The eLearning content has to be integrated into an overall learning system with focus on the learner. The target group delivers the information needed to produce a complete learning system that fits the learner's needs exactly. The four columns of the learning system – organisation, content, support and technology – have to be constructed according to the learner profile.

Organisation well adapted to the learner's need

The eLearning environment developed for both projects offers a high degree of independence. The learners can determine their own learning speed, they can learn whenever and wherever it is suitable for them. The focus on certain content takes place according to the individual preferences of each learner.

The participants are well-motivated adults and due to their profession they have a high degree of self-management skills for learning by themselves.

Learners are organized in small groups. Each learner group comprises between 25 and 100 participants and is subdivided into small peer-groups of about 8 persons. Each of these groups is headed and supervised by a specific tutor. These tutors are teachers with practical experience who have been trained specifically for this purpose and have done further training, as well as young scientists.

Content subject and practice-oriented

The didactic concept closely follows the experiences made in the most advanced countries and which have already resulted in standard solutions ('state of the art'). It is based on constructionalist learning models, emphasizing thus ‘open’, ‘active’ and ‘self-organizing’ learning forms. These types of training supply possibilities that are basically offered in application and project-based form. The examples and tasks are practice-related and emulate everyday teaching tasks. They always set out from concrete exercises which derive, as far as possible, from concrete school situations and whose solutions can be trained in this same practical field. This fact allows for the immediate transfer of learning contents to teaching situations, which leads to a prompt recognition of the added value of the training.

The Courses and their contents

The training involves a basic and an advanced course phase.

The first course phase (basic) takes about five months and demands about five and respectively four hours a week for learning and exercising. In the first part of the course, the participants learn how to

prepare their classes using ICT. This involves the use of office applications (Microsoft Office and OpenOffice) like text processing and presentation tools, the use and evaluation of web resources as information sources, how to design learning materials and how to use communication and co-operation tools. The units are specific to the teaching subject. Right now, the training is available for the subjects German, Biology, Physics, History, Arts, Geography, French, Religion, Politics, Elementary school (special course) and Mathematics.

In the second phase- the advanced phase, which takes about three months and also demands five hours a week for training and exercising. In the seven units of the advanced course, the teachers learn how to integrate ICT in the teaching process within the classroom. The course focuses upon project work at school integrating new media.

The course starts with a first unit explaining how to use the learning platform. In this unit, learners learn in step-by-step modus about the characteristics, meanings and advantages of the applications embedded in the learning management system. As one advantageous result, the learners develop the self-confidence and motivation that they need to get along with this new kind of learning system, right from the beginning.

All units have the same structure and design, self-evaluation tasks and all end with a compulsory task.

Support – Intensive and prompt support

Self-organized online learning should not signify "learning by oneself". Support is the determining key aspect for successful eLearning.

In both projects tutors, authors, technical hotline, and organisers carry out support.

The tutor plays a central role in the learning process, he/she takes care of motivation and ongoing support in all questions, organises face-to-face meetings and gives feedback on the unit tasks.

The content authors are also involved in the learning system, giving support on all questions concerning the content matter.

The course also offers a technical hotline, which gives advice on all technical problems, not only on issues concerning the learning platform itself.

The course organisers handle all questions concerning course enrolment and sequence.

All "supporters" are committed to giving an answer to learner questions within 24 hours!

The Learning Management System – Technical aspects remain in the background

Since the training takes place online the learning management system (LMS) fulfils two functions: it is the delivery medium for the contents and part of the learning content itself. Therefore the requirements on the learning management system are very high. The LMS has to be a "slim" and stable web environment system, with an integrated range of tools to support learning and communication between all persons involved in the learning process. According to the learner profile, it has to be as easy to deal with as possible, via a highly intuitive user interface.

As LMS, the platform ILIAS has been used. ILIAS, an open source platform, complies with the described requirements and, in addition, the open source code allows the implementation and adaptation of existing and new applications based on the demands of learners and tutors and permits the use of ILIAS outside the university, having no limitations on the number of users.

Evaluation

In all phases, training was accompanied by an evaluation process, in order to become aware of improvements required during the project, to judge the quality of the training, to analyse the learning process and the change of attitude towards ICT on the learner side, and finally to reflect about eLearning for teacher training.

Process-embedded improvement

The project was committed to a very tight contact to learners and tutors in order to find out about their experiences and, if possible, to improve the learning system according to their statements, proposals and answers in the questionnaires.

Despite the fact that in-service teachers and student teachers have very little experience with virtual learning environments, they have a very critical understanding of the added value of a web-based system for teacher training. The targeted participants are a precious source for constructive and critical contributions, resulting in continuous improvement. Some of the learners' suggestions could be promptly realized, which caused self-encouraging feedback for further suggestions, which then promptly came in.

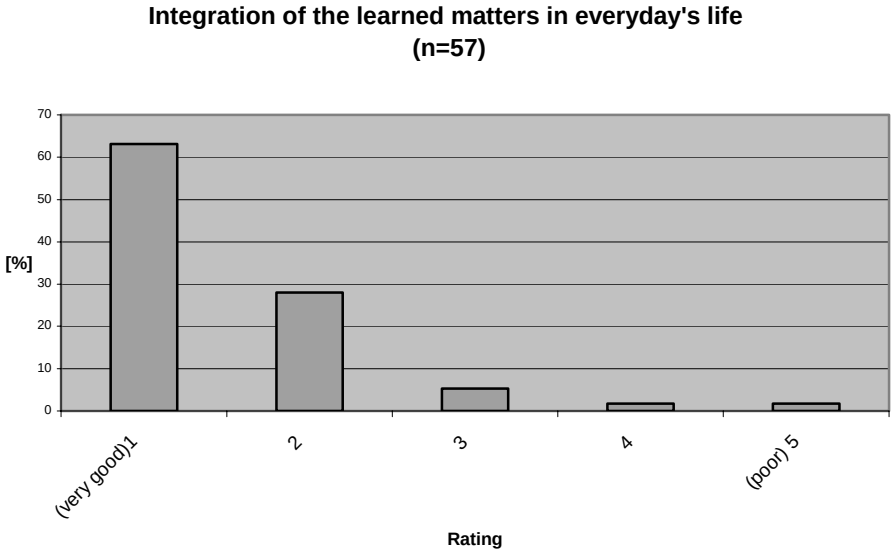
Quality of the training according to learners' statements

Did our efforts in choosing, implementing and improving the learning system as well as the learning contents match the learners' needs? Have the learners been satisfied with the virtual learning environment?

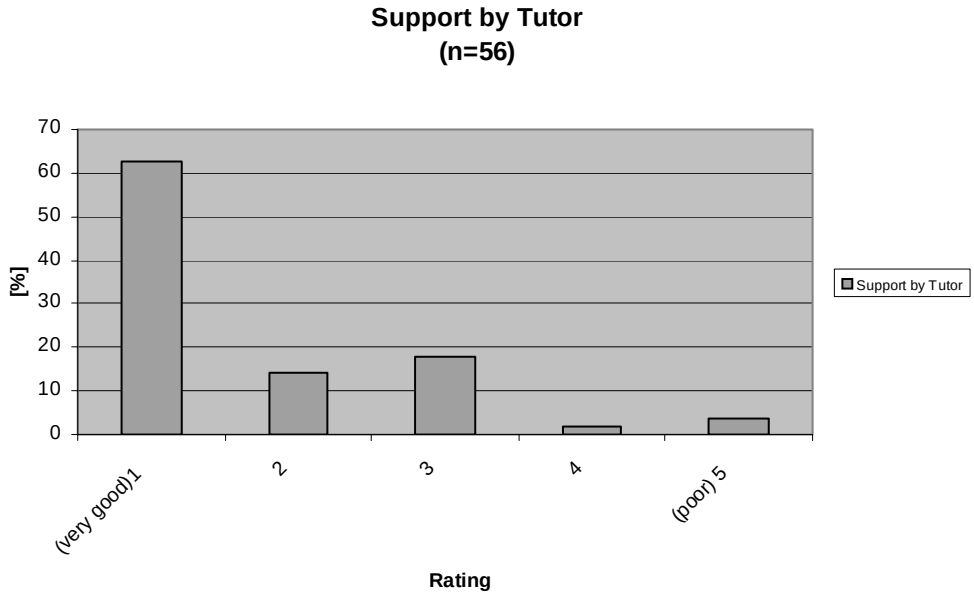
The learners delivered the answers as a part of evaluation during and after training.

Some of the results can be seen in the following examples (the charts reflect the questionnaires after two training cycles).

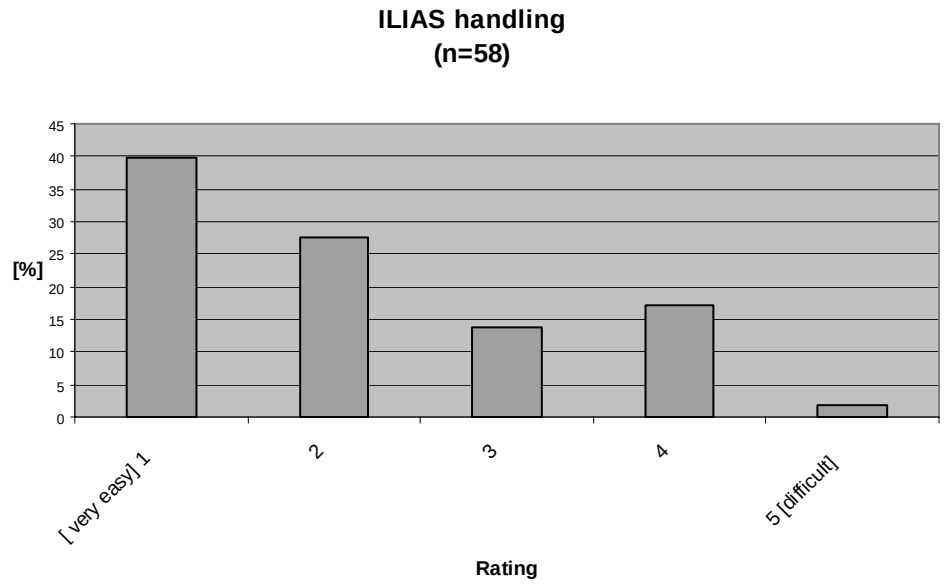
- One of the main objectives of the training was to develop a training method in which the acquired skills can be immediately transferred into everyday life. The learning units always set out from concrete exercises, which in most cases reflect concrete teaching situations and could immediately be used at school.



- The tutor plays the predominant role in the learning system. A good support by the tutors is decisive for a good learning system



- The learning platform (ILIAS) has to be a stable web environment system, with an integrated range of tools to support learning and communication. According to the learners' profile it has to be as easy to handle as possible.



Analysing the achievements on the learner's side

The main goal to be achieved was to put in-service teachers and student teachers in a position to be able to effectively and skillfully use ICT for and in their classes.

According to the information provided by the participants in the final questionnaires as well as in the meetings at the end of the courses, the following statements characterize the participants' individual situations at the end of training:

- In a very short time, in-service teachers and student teachers were able to effectively use ICT for and in their classes as well as their experienced colleagues. Many of them turned out to have become true experts in the field of ICT and education in their schools.
- The teachers' fears concerning the use of ICT completely disappeared
- The participants reported that their attitude towards students in terms of use of ICT changed completely. Teachers no longer feel unqualified to work with a computer in comparison with their students. Teachers regain the "leader and mentor role".
- Participants reported that due to the training, they now readily try out new teaching methods supported by ICT.
- Due to the acquired ICT-skills, participants stated that they now can easily deal with new software or hardware devices.

Reflection on eLearning for teacher training

Is there a link between the learning method and the success of training? Is eLearning for teacher ICT training the most suitable method?

After evaluating the statements of a large number of participants, we concluded that:

1. eLearning is a very suitable method for the training of in-service teachers and student teachers because of the high degree of independence offered by eLearning. To choose when and where to learn, to set the individual focus, to set the learning speed according to one's own needs, is very appropriate for teachers since they have very well-developed self-management skills, they are very motivated and prefer to work individually at home.
2. ICT as learning content *and* learning medium increases the learning success enormously.

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MENTORED INNOVATION MODEL IN TEACHER TRAINING – A SUCCESSFUL METHOD FOR PROMOTING EQUITY THROUGH ICT IN EDUCATION

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Background for the project: "ICT and the Quality of Learning" (1999-2001)

CERI, the educational research institute of the Organisation of Economic Co-operation and Development (OECD)**,** commissioned an extensive study to investigate if and how information and communication technologies (ICT) resulted in changes in the quality of teaching and learning in public education. **"***ICT and the Quality of Learning" (1999-2001)* involved researchers from 23 member and allied countries. As part of the project, school based case studies were executed that evaluated the functioning of schools incorporating ICT in education, internal and external communication and management.

It turned out that the majority of high level ICT users were well-equipped, innovative schools with high SES students, Altogether 91 cases were documented in 23 countries to verify five *pairs of hypotheses* through 3-6 school studies per country The anthropological/qualitative approach included structured interviews, observation of teaching and extracurricular activities, analysis of students' ICT-related work. Schools were revisited after 6, 12 and 18 months to see how educational change due to the introduction of ICT culture prevailed. (Cf. Venezky and Davis, 2001, Venezky and Kárpáti Eds., 2004)

Some results of this research showed different effects of ICT on education for Hungary – the only Eastern European country participating in the project – and the other OECD countries. The most conspicuous difference was the role of ICT in educational reform movements. One of the pairs of hypotheses investigated during the project intended to reveal how computerisation of schools effected modernisation. Two scenarios were outlined: „Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis indicated that innovative schools made the best use of technology, but where true school-wide improvement was found, ICT served only as an additional resource and not as a catalyst. (Venezky and Davis, 2001, 10) In the OECD countries, the first hypothesis proved to be valid. Those schools excelled in ICT-based innovations that had been outstanding in the use of up-to-date educational methods even before computers were ever installed. The summary of findings of this part of the study clearly indicated that infrastructure and student competence did not contribute to the success of the reforms as much as teacher attitudes, motivation and skills. Almost all of the school-based case studies showed that reform-oriented educational institutions with dedicated and highly trained staff to be the first to engage in computer-related educational reforms. These schools were considered cutting-edge, innovative institutions before using ICT and continued to do good work through an effective and intensive use of computer technology in teaching and communication. Infrastructure was helpful and student support often needed but by far not instrumental. Most innovative efforts produced a diffusion pattern characterized by Rogers (1995) as "classic" for educational innovations.

In Hungary, however, results seemed to suggest a different pattern. Here, ICT infrastructure at schools played a decisive role in the initiation of educational reforms. Computer culture proved to be a successful catalyst of educational innovations and actually solicited change. The most popular educational paradigms in our country at the time of the first computerisation campaigns were *constructivism*, *situationism*, and *collaborative learning*. Students who had been considered passive receptors of teacher-generated information for centuries were encouraged to construct their own knowledge and engage in creative, discovery based inquiry in realistic situations in teams. (Halász, 1999, Schooling for Tomorrow, 2001) Hungarian education that had been geared towards instruction in high quality abstract knowledge needed a strong impetus – indeed *a new teaching-learning platform* – to alter classic pedagogical views and methods. We observed a *direct connection between the level of infrastructure and the innovative quality of teaching and learning* in the schools observed

for the OECD study. (Kárpáti, 2003b) Though by far not practiced by all schools in Hungary, those institutions that were sufficiently equipped with ICT tools and digital teaching materials turned out to be much more motivated to upgrade their teaching culture than those who were left out of the computerization campaign. Similar results have been recently reported from France. (Pouts-Lajus *et al.,* 2001)

Apparently, in Hungary, computers acted like *Troyan horses* – smuggling an army of new methods within the fortified walls of perhaps the most traditional public sector in Hungary: education. Technology acted as an initiator of the reforms – but was it really a catalyst? Did it significantly contribute to the maintenance of innovative ideas and teaching – learning methods? Providing means is one aspect - another issue is the role of ICT in keeping up high level, innovative education. Here, our results approached those of other OECD countries more closely. Hungarian schools that had been innovative before the introduction of computers – for example, the first bilingual secondary school (www.karinthy.hu) or the first privately owned educational institution (www.akg.hu) – made a better use of the potentials of educational computing. Another group of schools in our sample, however – the tiny village primary school named after the great Hungarian computer scientist, John von Neumann, (www.enjai.sulinet.hu) or another primary school in a small town at a developing industrial area (www.almasi.mako.hu) initiated educational reforms clearly after the introduction of computer technology, inspired by its potentials. Therefore, we could not exclude the role of technology acting as a catalyst for better education although we agreed that a kernel innovation effort had to be present at a school to be successful in making full use of the potentials of ICT. (Kárpáti, 2002b)

The eve of the school computerisation campaign in Hungary, 1990-98, was characterized by massive investments in infrastructure. In the second phase, 1998-2001, the training of teachers was in the focus. Results of the first OECD study outlined above helped policy makers plan the next step of the reform movement: development of educationally valuable content and teaching methods to make best use of infrastructure and teacher competence and providing equal access to ICT culture for those with social, physical or mental handicaps. (Cf. Kárpáti, 2003a for an overview.)

In the third phase of computerization of Hungarian schools, starting in 2002, content development and diffusion of ICT-based teaching methods has become central for national sponsoring efforts. Research on student and teacher competence shows that *ICT skills are not age-specific* – even middle-aged teachers of humanities can be successfully trained for computer use. Training efforts are now geared towards medium and small size schools situated in small towns and villages where educational institutions may act as mediators of Knowledge Society culture also to adult citizens in their neighbourhood.

Extensive studies of small Hungarian village schools indicated, similarly to our OECD project findings, that ICT was perhaps the most effective device for schools situated in socially disadvantaged settlements that needed to make the "tiger's leap" and overcome decades of underdevelopment through one single investment. Fehér, 2000) No other educational toolkit can so flexibly be adopted to local needs, no other set of information is so easily extendable. During the student and parent surveys of the OECD project and other international evaluation efforts, we also noticed how popular ICT was even among the most disadvantaged youth groups whose parents made huge efforts to facilitate their children's involvement in a culture they hoped would help them fight poverty and achieve a social status much higher than themselves. (MONITOR, 2000) Therefore, in 2002, researchers suggested increased government support for small and medium size schools in villages and towns with modest cultural facilities to engage in computerization and staff training. It was generally assumed that ICT tools would help develop learning to learn skills and cognitive abilities of children with social handicaps more effectively because of its inherent motivational value.

"Promoting Equity Through ICT in Education", (2002-2005

In the next OECD initiated ICT research effort, coordinated by the Education Division of the organization, *equity* was chosen as one of the key issues to be investigated. In Hungary, sponsored by the Ministry of Education, our research team at Eötvös University, UNESCO Centre for ICT in Education was commissioned to launch our national research project in co-operation with OECD: the *Romani (Gypsy) Education Through ICT Project (2003-2005).*

Our aim was to introduce ICT-based teaching and learning methods in *10 primary schools* in secluded and poverty stricken villages of Northern Hungary, with 60% or more Gypsy student population. We created *ICT-enriched, constructivist learning environments* in 10 primary schools of Borsod County in Northern Hungary and develop teaching programmes for Hungarian Romani (Gypsy) children to overcome their learning handicaps and develop their national culture to its full potential.

Treatment method: ICT-supported teaching and learning in six disciplines

Our major aim was to develop cognitive, communicative-expressive and learning to learn skills and thus prepare students for secondary education and make students and teachers aware of the Gypsy cultural heritage through participation in national and international digital projects and creation of heritage sites and teaching aids. Boys and girls participated in the project with equal enthusiasm and good results. Gender in ICT education was not an issue.

Students of the partner schools were encouraged to work collaboratively on digital projects. We prepared students for secondary vocational and grammar school through individual development. *Information Technology (IT) is a compulsory school discipline* in Hungary. In our experiment, computer supported education focused on fostering information retrieval, processing and presentation skills. Extracurricular activities were also offered to help increase ICT competence of 93% of our experimental population: students who did not possess a computer at home. Through the creative use of digital communication media, we invited students and teachers to share Gypsy cultural heritage through home pages and school magazines.

Eight disciplines were selected for **ICT-enriched education**: **Art, Biology, Chemistry, Foreign Languages, Hungarian Language and Literature, History, Mathematics and Physics.** Textbooks for teachers including tried and tested lesson plans, software suggestions for different themes and tasks, as well as a CD-ROM with exemplary student work and teacher presentations, digital teaching aids and tests for immediate use developed for the first OECD project, "ICT and the Quality of Learning" were used here.

A similar volume containing projects especially suited for social inclusion through ICT is being prepared for publication as a continuation of the textbook series entitled "***Promoting Equity Through ICT in Education – Results of the Gypsy ICT Project"***. This volume will include lesson plans for Grades 7 and 8 (last grades of the compulsory elementary school in Hungary) for eight school disciplines and focus on developing cognitive abilities, foster learning to learn skills, improve communication skills and thus prepare for secondary education.

Mentored innovation – a successful model for teacher training in ICT

Teachers have entered the project with absolutely no ICT knowledge (78%), a medium level competency (12%) and a diploma or certificate in ICT (10%). After the summer course, the majority of novices asked for a supported European Computer Driver's Licence (ECDL) training course and have successfully taken the examination. Parallel with basic technology training, all teachers of the eight selected disciplines attended monthly *mentoring weekends* and learnt how to make more and more use of ICT-supported pedagogical knowledge, as they felt more competent in basic skills. Mentors – practicing teachers themselves with excellent ICT knowledge – supported them in *discipline – based groups* (comprised of teachers of the same discipline from the 10 experimental schools) through frequent e-mailing and virtual collaborative work.

Our experimental schools became ICT knowledge centres for their settlement by the end of the second school year. We train and encourage them to offer basic ICT courses for adults (mainly parents, grandparents and alumni) and help the work of the local administration with computer based clerical and Internet services.

Local teachers who have volunteered to participate in the experiment teach the five school disciplines that form the basis of the treatment. They have formed *discipline based ICT study circles* co-ordinated by *mentors*, members of our research team who are experienced teachers and ICT specialists at the same time. Three of the five mentors are currently working on their PhD dissertation connected to the project, thus they act as participating observers and facilitators at the same time. Study circles meet once a moth for a weekend to discuss problems of ICT use in their discipline, share teaching results, learn and practice new methods or experiment with a new device or teaching aid.

Mentors always presented samples of their own work with ICT (video documentaries, PowerPoint presentations and small programmes (for example, Java applets) they developed for educational use and share student work with their colleagues. They described in detail, how they prepare for ICT-supported classes, what information resources they use, which tools they found most helpful for the development or adaptation of teaching aids, how much time does it take to prepare for a lesson, and how can student development be best assessed. Thus, local teachers, novices in educational computing, did not only learn methods but also a new working culture presented by an authentic role model: their peer.

School principals unanimously agree that ICT-enriched education may be the chance of a lifetime for their students and support their staff members in their re-training efforts. Still, it is extremely difficult for participating teachers to learn about new educational technology and a new philosophy and practice of teaching at the same time. Several teachers complained about intellectual or emotional overburden but none left the project. In fact, village intellectuals seemed to welcome the chance of adherence to a larger professional community and enjoy the team spirit.

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TEACHERS' TRAINING ON THE PEDAGOGICAL INTEGRATION OF ICT EPICT LICENSE: EVALUATION OF THE PILOT APPLICATION IN GREECE

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Introduction – The EPICT License in Greece

Enhancing ICTs in education and developing school-based and nation-wide information and communication technology infrastructures has been a central feature of the recent attempted education reforms in Greece. This course of action was strengthened even further, in order for the Greek education to comply with the decisions taken under the eEurope initiative [Commission of the European Communities (2000), *Report from the Commission to the Council and the European Parliament "Designing tomorrow's education – Promoting innovation with new technologies"*, COM(2000) 23 final. Brussels, 27.1.2000.]. This line of policy included in-service training for teachers, whose attitudes and expertise of ICT were considered crucial for the successful incorporation of new technologies in education and the learning process. The Greek Ministry of Education launched in 2001 the "Operational Program for the Information Society" for the period 2000-2006 to provide schools with equipment and facilities, to establish an educational network and develop ICTs in education. This program extended previous initiatives such as the 1996-2000 *Odysseia* action, which aimed at incorporating ICTs in the administration and instructional processes of 380 Schools of Secondary Education. Some of the key aims of the Operational Program have been, among others, to provide schools with ICT equipment and facilities; to provide all schools with Internet access by the end of 2001 and to install an intranet in all Greek schools by the end of 2006; to ensure Internet access for pupils and teachers through the advancement of a national network for education (EduNet); to invest on elearning solutions.

Concerning in-service training of teachers in ICTs, the relevant literature mentions that, in broad terms, two types of such training seeking to achieve ICT expertise of teachers have been enacted across Europe: The first emphasizes basic functional ICT competence, focusing on the use of computer hardware and software. The second prioritizes the pedagogical skills and the understanding of ICTs, which is essential for effective use of the new technologies in the classroom. While the first approach treats schoolteachers as every other citizen who should be able to use ICTs in everyday life, the second approach usually requires teachers to understand the innovative learning opportunities ICT may offer, how these resources can be managed in the classroom and how learning could change. It calls for convincing teachers of the pedagogical benefits of using ICTs in their daily practice and enabling them to use ICTs to this end [The European Expert's Network for Educational Technology – EENet (1998) *How learning is changing: information and communication technology across Europe*. Coventry: Becta.].

In a number of surveys, Greek teachers strongly expressed their demand for ICTs in-service training and stated that they would use ICTs in their daily instructional practice if they knew how to do it [Mattheou, D., Karadja, E. Roussakis, Y. (2000), "Innovations in the Programmes of Study in Initial Edication and In-service Training of the Primary School Teachers in Greece: A Comparative Approach from the View of the International Studies in Education", in INEAG, Wyzsza Szkola Bizneu, National Lewis University, *Technology in Teaching and Learning in higher Education: An International Conference*. Samos: INEAG]. This is extremely important for the introduction of an in-service training program which would not only aim at giving educators the technical knowledge on ICTs but would primarily focus on the pedagogical implementation of the ICT knowledge. Given the transitional phase of Greek education towards the introduction of ICTs, the authors believe that a teachers training initiative like EPICT License, which combines "classroom instruction; work in teams of teachers, independent work and distance education" and "is developed continuously"

[EPICT (2004) www.epict.org, *The EPICT Brochure* (in Greek), Athens.] has the potential of providing a good practice for the in-service training of Greek teachers.

EPICT pilot implementation in GREECE

In order to "elaborate, customize, implement and evaluate the generic EPICT model" in Greece, the Lambrakis Foundation collaborated with the University of Athens (Faculty of Primary Education), the University of Ioannina, the Computer Technology Institute, which have been involved in and implemented Primary and Secondary Education teachers training ("e.g. the pedagogical integration of computers, basic ICT skills for Primary and Secondary Education teachers, etc.").

Seventy five (75) teachers were selected to participate in the EPICT pilot training course. The selection was made in accordance with the provisions of the pilot planning of the course, fulfilling both geographic / spatial and social characteristics among volunteered educators. The participants were assigned to 18 school-based groups supported by 9 facilitators. 54,2% of the participants were female, and 45,8% were male. 69,4% of the participants were primary education teachers and 30,6% were lower secondary education teachers.

The training was supported by the techniques of distance education (flexible forms) and constitutes combination of techniques of supported self-instruction (supported self-learning) and collaborative learning. The training program included also at least two face-to-face meetings in a seminar character (classroom-based learning) between instructors and trainees, at the beginning and during the training circle. Within the program, the education is offered via the Internet, with intensive guidance from the instructors and communication and collaboration in groups of teachers (trainees) for the completion of work and exercises of evaluation.

The duration of the course lasted 7 months (December 2004 – June 2005) and in principle it was estimated that the trainees worked about 120 hours in total. Most of the training process was carried out on line through the e-learning platform, which was developed specially to support the pilot phase throughout the training period.

The first f2f session was an introductory seminar, in which the participants had the chance to be informed of the objectives of the program, the content, the context and the logistics of the training course. Moreover, the participants have been presented with the content of the learning modules available and especially the preliminary one, which was about how to write learning scenarios. The preliminary module was developed in order to facilitate the assignments that they had to submit at the end of each module.

The EPICT evaluation process

The aims of the evaluation process

A key aim of the evaluation process of EPICT pilot application in Greece was to assess the effectiveness of providing school teachers in-service training based on the principles of team-work, collaborative learning, process oriented work and qualifying guidance. In particular, the original objectives of the evaluation process were to identify:

- The effectiveness of the EPICT-specific training model in supporting in-service, school-based, teachers' training;
- The effectiveness of the EPICT-specific training model in promoting the pedagogical integration of ICT in the learning process;
- The factors affecting the integration and successful use of ICT in school education;
- The skills facilitators and trainees need for handling online training environments;
- The factors affecting failure and success of teachers-trainees in completing the online courses;
- The appropriateness of the EPIC-specific training material in online training.

The theoretical framework of the evaluation

Many researchers are spending time evaluating the use of online learning environments to examine the effects of their use. A great number of theoretical models and evaluation instruments have been created to delineate which models, methods, activities and actors are most effective in terms of cost and learning, in creating and distributing quality online training programs (Dempster, 2003, Wallace, 2003; Garrison 2000, Saba, 2000, Jegede, Fraser, & Fisher, 1998).

The framework used to guide the EPICT evaluation process is based on Andersons' model of e-learning evaluation (Anderson, 2004). This model illustrates most of the key variables, which interact to develop effective online educational experiences and contexts. One of its basic assumptions is that effective learning should be knowledge, community, assessment, and learner centered (Bransford *et al*, 1999). Following Anderson's model for the evaluation of online learning, seven scales/variables which were deemed essential for creating effective online educational experiences in an effective environment were identified. These seven scales are presented in Table 1.

Table 1. EPICT evaluation scales

On line learning forms	Scales
Knowledge centered	1. Personal development
Learner Centered	2. Independent learning 3. Educational material
Community Centered	4. Interaction 5. Peer-Collaboration
Assessment centered	6. Support 7. System Management
	8. Satisfaction

In addition to the seven scales designed to measure the attributes of online learning, a scale of satisfaction, adopted from the Fraser's Test of Science Related Attitudes (1981) was included. Walker (2002) notes that, "*student satisfaction is not a measure of the learning environment, yet it is used consistently in post-secondary education to measure how effectively a program or institution delivers what students, expect, need and want, and is associated with student achievement*".

The methodology of the evaluation

A systematic multi-method approach was employed to evaluate the EPICT course, gathering data from trainees, facilitators, training providers and learning materials. Both quantitative and qualitative research was carried out and the findings and conclusions of both are presented in this report. The evaluation research included surveys concerning the training process and the learning materials, interviews and a focus group discussion with trainees, facilitators, course designers, and training providers and was carried out in June and July 2005. The evaluation instruments included:

- The EPICT trainees' questionnaire: The questionnaire was distributed on line to all trainees and contained two sections: The first section was designed to gather personal information on the trainees. The second section of the questionnaire consisted of twenty-three items intended to measure the eight scales of the effectiveness of the online training. The questionnaire also included an open-ended question asking for the trainees' assessment of online training process and their suggestions for improvement. It was administered as an online form.
- The semi-structured interviews with a selected sample of the participants: In-depth interviews were carried out with trainees and facilitators at the end of the course.
- The focus group discussion involving trainees, facilitators, course designers, web designers and training providers: A focus group discussion involving with trainees, facilitators, members of the course designers team and the training management team was carried out at the end of the course. The discussion was directed by one member of the evaluation team.

- The questionnaire and the evaluators' analysis of the learning material: A questionnaire was designed to obtain the trainees' views about the learning material used in each module and their assessment of the quality and relevance of the learning materials, exercises, assignments, and manuals they used. This questionnaire had 11 scale-answered questions and was administered as an online form.

All groups involved in the EPICT pilot project were asked their opinion and personal assessment of the provided learning material during the interviews and the focus group discussion. The evaluators also asked for the views of selected people from the group that prepared and localized the EPICT learning material.

The evaluation results

- *Satisfaction.* The trainees were satisfied by their participation in the EPICT course both by the technical and pedagogic knowledge they acquired and by the collaborative distance learning training process. They adapted well to the distance training process requirements and stated that the course significantly helped them in learning and incorporating ICTs into their daily teaching practices.
- *Personal Development.* The educators who completed the course stated that they were able to develop pedagogic scenarios and use ICT in their teaching process. The majority of the participants stated that they would change their existing teaching practices and include ICT in their instructional repertoire. Concerning the on line training process they mentioned three areas of particular interest: (a) they have acquired useful knowledge about specific educational software packages, (b) they have studied real case studies related to their instruction and (c) they feel that they can combine the skills they have acquired from EPICT to develop educational / pedagogic scenarios for the real life situations in their classrooms.
- *Independent Learning.* The educators who attended the EPICT course stated that they had the opportunity to take an active role in implementing the knowledge and skills they learned on a daily basis. The fact that EPICT is an in-service training course allowed the participants to flexibly organize their work schedule.
- *Learning Material.* Generally, participants expressed positive views about the learning materials. It is remarkable though that their views vary between the modules. In several cases the participants suggested that (a) the learning material should be better written and provide clear and specific directions (b) the optional modules should contain more specific and detailed information (c) should be more relevant to the assignments (d) contain self – evaluation exercises so they could be able to test their knowledge.
- *Interaction.* Participants expressed positive views about their interaction with other team members and with their facilitators at most cases. The facilitators responded promptly to their questions and provided effective feedback. The communicated mainly through e-mail messaging. On the other hand, the participants did not use additional communication facilities (forums and the provided chat room options) of the EPICT web site to communicate with other trainees and facilitators.
- *Collaboration.* The participants stated that team collaboration assisted them to develop their knowledge on the pedagogic use of ICT and develop a positive attitude towards collaborative learning approaches. They stated that they enjoyed discussing ideas with team colleagues and jointly fulfill their assignments. It is important, though, to note that collaboration was limited only among team members and did not develop across teams.
- *Support.* The facilitators provided timely and clear feedback but the participants would like them to have a more active role, providing suggestions and giving directions than merely correcting their assignments.
- *System management.* (a) Platform. The interface did not create serious obstacles to the learning process. There were problems occasionally concerning the posting of assignments and downloading the instructional material. (b) Organizational issues. The participants would

like more meetings with their facilitators, and probably to have intermediate meetings for better feedback. They also suggest the EPICT to expand over a longer time span so they would have adequate time to work with their assignments.

Conclusions

- The evaluation has shown that the EPICT professional development / training model is effective in supporting school-based, in-service teachers' training for Greek educators. It is more advanced, flexible and open-ended than any of the projects aiming at the professional development of Greek educators in ICTs.
- The distinct characteristic that renders the EPICT License more relevant than other similar programs is its effectiveness in promoting the pedagogical integration of ICT in the learning process in Greek schools. Most educators who participated in the pilot phase stated that they have already begun to integrate ICT scenarios in their practice. This is considered to be very important, as there many counter-examples which warn us of the difficulty to translate in-service training to educational / learning practices.
- One significant contribution of the EPICT course is that it successfully introduced collaborative distance learning in Greek in-service training practices.
- The evaluation process revealed that there are many things to be done in order to secure the successful implementation of the EPICT course in Greece, such as the improvement in the localization of the provided learning material or the improvement, and the possible extension, of the introductory seminar and the training of facilitators.
- The evaluators think that the EPICT course is appropriate for the effective online ICT in-service training of educators in Greece and should be developed to a full-fledged training alternative.

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POLICY AMBIGUITY AND TEACHER CONFUSION – CAN TEACHER EDUCATION LEAD US OUT OF THIS MAZE?

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Abstract

This paper presents the rational for a 'round table' or symposium be held in the Open Classroom Conference at Poitiers: 5-7 October 2005 and the argument backing this rational.

These rational and background stem from an analysis of a recently published anthology (Aviram & Richardson (eds.) *On What Does the Turtle Stand? Rethinking Education for the Digital Era*, Dordrecht: Kluwer, 2004). The anthology presents the views of sixteen leading thinkers and educators worldwide on three fundamental questions:

- What should be the aims of the 'computerization of education'?
- What are the best ways to achieve these aims?
- Why have these aims not been achieved (as almost all contributors agree) so far?

An introductory presentation will comprise two phases:

- A brief presentation (max. 10 mins) of three emerging issues:
  - Ambiguity of prevailing ICT integration policies in the educational arena
  - Tensions and contradictions between prevailing educational policy, educational structures and the actual situation in schools
  - The mistrust, 'double talk' and resistance to change that infuses teachers' attitudes to the integration of not only ICT but more particularly active learning based on ICT.
- Argumentation (10 mins) substantiating the hypotheses that the above teachers' attitudes can be put down (also) to:
  - The ambiguity inherent in policies of change and reform
  - The tensions and contradictions between declared and prevailing policies, and the actual situation in schools.
- An interactive round table discussion will follow with a panel of 3 or 4 experts focusing on four key areas:
  - The validity of the statements formulated in phase I above
  - Acceptability and repercussions of the hypotheses formulated in phase II
  - Potential responses to rectify the current state of affairs and, more specifically:
  - Consideration of the questions: Can teacher education (pre-service and in-service) be modified to constructively deal with the issue? If so – does it require fundamental change of teacher education? What kind of change?

Background: an era of kaleidoscopic confusion

The kaleidoscopic confusions characterizing the area of ICT-based educational views: primary presentation

While e-learning and the integration of ICT in education are constantly advancing all over the world, the policies underlying this multi-billion project are often elusive, or not coherent in terms of their ultimate aims, basic assumptions and guiding values.

This state of affairs is due to the following facts:

- In logical and practical terms there are many policies concerning the integration of ICT in education which differ from and sometimes contradict each other on all possible relevant levels:
  - the ultimate social aims of education
  - the didactic aims which should lead to the achievement of the social aims
  - the procedural institutional processes and structures (also) concerning ICT that should be achieved in order to attain these aims (see below for clarification of these terms).
- Even within the framework of what might look like the same view concerning the integration of ICT in education there is room for infinite variations; this is the case due to infinite possibilities of understanding key terms, their operationalizations and their combinations.
- Many of these differing (or contradictory) policies are active at the same time, often at the same school, in the same region or state.
- Furthermore, the 'small' confusion relating to the integration of ICT in education is part of a 'larger confusion' stemming from the numerous waves of various (and often contradictory) reforms that educational systems in many Western countries have gone through in the last thirty years.
- To make things even worse, these two related confusions are '*dynamic*' or '*kaleidoscopic confusions*' – dominant reforms (on both levels) and smaller processes of change rise to power are soon eclipsed (often not even having enough time to fail), fade away and are replaced by other (often contradictory) reforms and changes.

Aanalysis of sixteen experts views as a reflective example of the dominant kaleidoscopic confusions

This is one of the outcomes of a post-facto analysis of both the explicit claims and tacit positions expressed in an anthology we recently edited (Aviram & Richardson 2004). It presents the views of sixteen leading thinkers and educators from all over the world about three basic questions:

- What should be the aims of the 'computerization of education'?
- What are the best ways to achieve these aims?
- Why have these aims not been achieved (as almost all contributors agree) up until now?

We consider the results of this analysis to be fairly representative of the rich variety of views that are currently influential 'in the field' regarding the integration of ICT in education.

In order to better explain and substantiate the above claims, we must refer, albeit in schematic terms only, to the main results of the analysis of the set of sixteen answers to the above questions presented in the anthology, and primarily to the results of the analysis of the various views as they relate to two sets of *outcomes-oriented aims (*aims referring to the outcomes of the educational process): *social aim*s and *didactic aims,* and to the level of *procedural aims* (aims viewed as necessary in order to institute the educational process required so as to attain the outcomes-oriented aims).

'S*ocial aims*' relates to the ultimate aims of education or to the good that it is perceived as producing for societies and their citizens. '*Didactic aims*' relates to the outcomes that the desired modes of learning and teaching are expected to produce, which in turn are conceived by various contributors (and many other thinkers, professionals and educators) as being (at least) necessary conditions for the achievement of the *social aims*.

The main *social aims* mentioned by the contributors were:

- The development of the economy (or the economic growth of a certain society through the enhancement of its competitiveness in the global economy). We call this 'the Globalist View'.
- The enhancement of various humanistic values – starting from the autonomy and self-expression of individuals, continuing through social justice and integration in society. and ending with commitment to the welfare of the globe. We refer to this view as 'the Humanistic View'.
- Merely 'advancing with' technological development. We refer to this as 'the Heretical View' since it questions the epistemic possibility and even morality of the previous views.

The main *didactic aims* mentioned by contributors were:

- The enhancement of mastery of basic skills
- The enhancement of mastery of digital skills or literacy
- The achievement of higher levels of knowledge of the sciences
- The development of active (or constructivist) learning capacities.

Besides these two levels of *outcomes-oriented aims*, most of the contributors referred to a third level of *procedural aims*, which included (at least) three basic variables:

The technology used (or to be used – in those papers that were prescriptive rather than descriptive). This variable was given a variety of meanings, including:

- The use of PCs in the classroom/laboratory
- The use of laptops in and/or outside the classroom
- The use of mobile devices in and/or outside the classroom
- The use of various devices privately owned by pupils, with an emphasis not on the kind of technology but rather on its functions.

The organizational structure relied on (or to be relied on). This variable was given a variety of meanings including:

- The conventional classroom
- Conventional classroom activities organized fairly conventionally but outside the classroom and school setting
- Special community centers where pupils meet several times a week
- Open-ended activities carried out in the community or in 'the world'.

The contents referred to (or to be referred to). This variable was given a variety of meanings including:

- Predetermined conventional disciplinary curricula
- Predetermined curricula focusing on digital skills and literacy development
- Predetermined curricula focusing on basic skills and literacy development
- Predetermined curricula deemed necessary for students' development as:
  - empowered citizens, or
  - active learners, or
  - self-fulfilling individuals or
  - individuals committed to global welfare.
- Undefined non-structured curriculum stemming – as the educational process progresses - from students' interest and involvement in the community and society.

There are many possible relations between various goals of the two first levels. Globalists, for example, can support each of the above *didactic aims* on the basis of their assumptions about two sets of facts: the kind and outcomes of learning that best support the economy, and effective learning and

teaching. The same holds true of humanists: they can support each of the above *didactic aims*, depending on their conception of 'humanism' and 'learning' and the relationship between them. Furthermore, both can opt for various combinations of various specific meanings accorded to the three core variables of the *procedural aims*.

Similarly, there are infinite ways of understanding humanistic aims (individual development, commitment to social justice and integration and commitment to global welfare). Just to take one major concept – 'autonomy': its meanings can range from simply referring to the fact that the individual in question is not constrained in doing what they want in a certain context, to more demanding reference to the individual personality. This in turn can have meanings ranging from the mere 'ability to learn in a way which is conceived as relatively independent', through the more demanding 'rationality' and even more demanding 'reflective and critical rationality', to the most demanding 'ability for self-direction' – or some combination of these.

There is also potentially and practically an infinite number of understandings of 'basic skills', 'digital skills' and the relationships between them. Just to relate to the last point: the enhancement of basic skills can be conceived of as being opposed or complementary to the aim of enhancing digital skills, depending on one's views of the nature of the various skills and the cultures they stem from and their interrelations.

All this leads to 'a very large infinity' of potential combinations of specific aims of the first level, with specific aims of the second level with various understandings of the variables on the three levels each of the procedural aims should have.

As a matter of fact, in practice one can detect (in the above anthology as well as elsewhere) prima facie groupings of various combinations of positions on the three levels of aims referred to above. For example, a large group of Globalists tend to support conventional knowledge acquisition + conventional learning and teaching + conventional contents and organizational structures; with "e-learning", meaning for them the partial use of PCs for conventional learning. On the other hand, there are many Humanists who tend to support more constructivist learning approaches and more open approaches to organization and contents.

However, these groupings are far from inevitable or necessary. For each of them contrary groupings that are also influential can be identified. Thus there are Globalists who mainly support the acquisition of skills – basic and digital (as opposed to the acquisition of knowledge), are inclined to use constructivist methods and more open curricular and organizational structures and hence to rely on a more open-ended use of technology. There are Humanists, on the other hand, who see the studying of the traditional liberal curriculum (i.e. the main scientific disciplines) as a *sine qua non* of personal development and conceive of ICT as a potential enemy whose influence in school should be reduced to the needed minimum.

To render the situation even more complex, it so happens that the necessary integration of ICT in education in the last two decades coincided in many countries with growing dissatisfaction with the education system and the strengthening of the feeling that 'changes' or 'reforms', sometimes radical ones, were necessary . This has led to many waves of reforms and changes on various levels, directed towards various (sometimes conflicting) ends: 'restructuring', 'teachers empowerment', 'parental choice', 'self-management', 'effective schooling', 'accountability', 'active or constructivist learning', 'systemic approach to education', 'the formation of universal standards', 'back to basics' – these are just few well-known 'battle slogans' referring to influential waves of reform with various emphases and based on different and often opposed theories and ideologies (social and educational) coming and going in the all-too-familiar and much lamented 'pendulum movement', and, even worse, often active in the same places (schools, regions, societies) at the same time.

Teachers' fatigue and resistance to change as stemming from the kaleidoscopic confusions

Thus, while until three or four decades ago it was clear what it meant to be a teacher and a student, what 'learning' was and what 'teaching' should be about, today teachers necessarily live and act in an

ever-changing conceptual chaos. They encounter a multitude of such concepts, often coexisting and sometimes contradicting each other, stemming both from the above waves of reforms and from the multitude of policies and variation in policies on the integration of ICT in education. If we add to these two categories of confusion, the fact that this conceptual chaos is **kaleidoscopic** or **dynamic** (i.e. the various reforms, both ICT-related and not, come to power and fade very quickly – today's sacred words are tomorrow's subjects of blame and mockery, and vice versa) we cannot but anticipate that teachers will become extremely confused.

Furthermore they are required to be enthusiastic about each and every reform and invest much time (often unpaid), energy (which they largely lack since it is gradually becoming more and more difficult to deal with the various disciplinary problems that they encounter daily in the classroom) and trust (which they are rapidly losing) in any new reform, as if it they really believed it to be the panacea that is going to change everything – a story that they have heard (at least) several times since they left teacher training college a few years ago without even once coming close to achieving some level of fulfilment.

Can we wonder that average teachers rapidly loses any faith they may once have had, reducing their level of involvement in any 'promising new' reform or technology to the necessary minimum, and even this only verbally?

Confused, suspicious and exhausted they limit their level of friction with reality to the smallest possible area, and 'behind the classroom door' retreat to the only thing of which they are certain: the 'good old' methods of teaching and learning prevalent for centuries, within which limits they try to do their best.

The questions that must be faced

Both in our anthology and in other relevant texts there is productive discussion on the necessary conditions for successful integration of ICT with education, and on the factors that prevent this from being the case for most schools. While ' teachers' resistance to change' has often been mentioned and discussed as an important explanation for the prevalent failures in the integration of ICT in education, not enough attention has been paid to the above *kaleidoscopic confusion* leading to mistrust and exhaustion as a possible (though not necessarily exclusive) explanation for this resistance. One possible reason for this lack is the fact that we (academic researchers, professionals in the field) and policymakers are partly responsible for this *kaleidoscopic confusion.*

This is why it is also incumbent on us to pay attention to it and (assuming one accepts the argument so far) face the questions:

- Are there ways to reduce this confusion, or is it a necessary part of this radical transition to the digital civilization of which we are part?
- In both of the above cases, how can teachers' education (pre-service and in-service) be re-designed in order to prepare teachers, educational administrators and low- and intermediate-level decision-makers to productively deal with this confusion?

These are the questions that we will ask participants in the symposium to address after a short presentation and defence of the above arguments.

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PROFESSIONAL REPRESENTATIONS OF CNED TEACHERS ABOUT OPEN-LEARNING[1]

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The research presented here deals with job analysis within adult learning.

We have tried to understand how teachers, used to working in a classroom, face to face, with children and teen-agers, could integrate a pattern of distance learning for adult learners.

Nowadays, the development of distance makes learning more and more independent from unity of time and place, and enables the use of various resources. Therefore, learning must adapt itself to individual needs and attempt not to ignore responsabilities which have to do with family and professional life.

These expectations make new ways of teaching necessary:

- the devices have to allow individualization of learning courses, evaluations, analysis of needs and advice in what affects courses and learning;
- the services have to be adapted to goals, levels and availabilities of the learners: they can learn at their office, at home or in a school, with individual or collective systems, in presence of a teacher or by distant learning.

In many ways, open learning represents something new on the learning market and, if technologies have taken a step backwards, the new patterns of pedagogical organization of open learning have become essential.

Many public or private institutions open themselves to this new way of training. Among these institutions, the Cned has a special place due to its own history. This public institution, part of the French Ministry of National Education has the public mission to deal with the teaching of children and teen-agers who, for various reasons, cannot attend school. The Cned follows also a mission in the area of training (professional learning). Most of Cned teachers come from initial teaching in schools and universities.

This particular position and this caracteristical point of the Cned are our main interest research:

- On the one hand, this institution is drawn by evolutions of adult training who need more individualization and variability;
- On the other hand, it is anchored in a traditional learning pattern because of its history and people who work in it.

Human resources are a main issue to make the Cned evolve in a competitive and challenging market. People have conceptions of their jobs and these conceptions lead us to work on the representations they have:

- about the systems they are working in;
- about their role in these systems;
- about their practice and pedagogical habits in these systems.

People objects of investigation

We chose to study the population of teachers who have both a face to face activity with children and teen-agers and who work at the same time with Cned as writers of syllabus, correctors or tutors.

[1] Recherche réalisée dans le cadre du DEA: «formation des adultes, champs de recherche»
Conservatoire National des Arts et Métiers – Centre de recherche sur la formation
Université de Paris XIII – Université Catholique de Louvain

This choice was made because this category of teachers enabled us to make comparisons between presential teaching and distance learning.

Moreover, we selected institutes of the Cned specialized in adult training:

- institute of Vanves for adult training on French *"concours d'enseignants"*;
- institute of Lyon for training on tertiary sector;
- institute of Grenoble for training on industrial sector;
- institute of Poitiers for training on economy, management and languages.

The analysis pattern built from this population can be transferred to other Cned specific jobs, more decisive for the Cned challenges.

Theoritical frame

Social representations, more particularly professional ones described by Jean-François Blin[2], give us an analysis pattern:

- contextual dimension from descriptive cognitions;
- functional dimension from prescriptive cognitions;
- identity dimension from evaluative cognitions.

This theoritical basis enables us to enhance functional patterns which are presential teaching pattern and open learning pattern, and to build identity types in order to classify the studied population.

Results

Identity dimension and functional dimension are connected, especially for two identity types:

- the type we called "relation" is inclined to focus its methods on learners activity and project; teachers who belong to this type are close to a functional pattern connected with open learning;
- the type we called "magister", which uses, most of the time, transmissive methods, is applied to a kind of teachers whose vision of job is close to face to face and initial teaching functional pattern.

These identity types, connected to functional patterns, enable us to enhance a typology of behaviours of teachers by the way they accept or reject the functional patterns introduced in our investigation:

- a behaviour close to open learning and far from face to face initial teaching;
- a behaviour far from face to face initial teaching, but not involved in open learning;
- a behaviour close to face to face initial teaching and far from open learning;
- a behaviour close to both face to face initial learning and open learning.

This typology, even if it is simplified, might set the basis of a tool for forthcoming learning plans or recruitment of the human resources at the Cned:

- learning plans: this study about professional representations enables to enhance ways to develop skills by showing representations which have to evolve like taking into account learners activity, project and motivation, mentoring of self-learning…
- recruitment: this tool should be able to explore how an applicant feels about distance learning and which is his point of view on the matter.

[2] Blin, J-F., (2002) *Représentations, pratiques et identités professionnelles*, l'harmattan, paris

LES ENSEIGNANTS SONT-ILS PRÊTS À UTILISER LES TICE POUR SE FORMER?

Michel Sanz, Institut de Toulouse du Cned, France

Résumé/abstract

Stepping softly into ICT.
This presentation aims at explaining the choice the French national centre for education, in charge of the vocational and continuing distance training of primary school teachers – a potentially large number of students (in 2004, 200 signed in) – had to make when it created the courses preparing three specific exams teachers have to pass to obtain the necessary qualifications.

ICT, which the Cned institute meant to introduce and rely on for those courses, had to be "softened down", and are mostly used to support online services, as an initiation as well as a means towards training.

Afin de lever tout ambiguïté dans mon propos, il convient d'emblée de répondre «oui» à la question de ce titre quelque peu provocateur.

Mais si cette question est posée, c'est bien parce que cela n'a pas toujours été évident dans un passé récent et qu'il reste çà et là quelques réticences fortes.

C'est d'ailleurs la raison pour laquelle l'Institut de Toulouse du Cned a fait le choix de formations présentées de façon traditionnelle avec des compléments ou des services en ligne quand il s'est agi de proposer de nouvelles formations aux enseignants du 1er degré.

Il y a trois ans, l'institut de Toulouse du Cned s'est vu confier les formations initiale[1] et continue, à distance, des enseignants du 1er degré. En ayant une bonne connaissance des besoins en formation de ces enseignants et en fonction des possibilités qui étaient les nôtres, nous avons choisi de concevoir dans un temps relativement court trois formations:

- *Préparer le CAFIPEMF* (certificat d'aptitude aux fonctions d'instituteur ou professeur des écoles maître formateur»
- *Préparer l'habilitation et enseigner une langue étrangère à l'école primaire* – Tome 1 *l'anglais.*
- *Préparer le CAPA-SH* (certificat d'aptitude professionnelle pour les aides spécialisées, les enseignements adaptés et la scolarisation des élèves en situation de handicap) – option E, option D et option F

Il s'agit de certifications professionnelles qui permettent à un enseignant du 1er degré d'accéder, s'il a réussi l'examen, à de nouvelles fonctions intéressantes à plus d'un titre, y compris en termes de rémunération.

La première formation que nous avons conçue à destination des enseignants du 1er degré a été «Préparer le CAFIPEMF». Elle a été la première d'une collection qui se poursuit avec «Préparer l'habilitation et enseigner une langue étrangère à l'école primaire – anglais» (printemps 2006) puis avec «Préparer le CAPA – SH» (janvier 2007).

[1] La formation initiale des enseignants du 1er degré commence juste après le concours de recrutement de professeur des écoles (CRPE)

Sans entrer dans le détail de ces formations, il convient de préciser que l'obtention du CAFIPEMF permet d'accéder aux fonctions de maître formateur puis, le plus souvent, de conseiller pédagogique adjoint à l'inspecteur de l'éducation nationale. Cet examen, difficile, se déroule en trois étapes définies par un texte officiel. Les inspections académiques proposent, le plus souvent, dans le cadre du plan départemental de formation, une préparation à cet examen mais cette préparation peut aller d'une demi-journée (souvent une réunion d'information) en début scolaire … à plusieurs demi-journées tout au long de l'année avec un véritable suivi individualisé. Le plus souvent, les candidats sont très motivés et malgré un taux d'échec relativement élevé, la motivation est forte.

Permettre de préparer cet examen à distance a été pour nous l'occasion de relever plusieurs défis.

- Le premier défi: proposer une formation d'une certaine «consistance» sans contenus disciplinaires précis.
- Le deuxième défi: préparer des épreuves qui se déroulent essentiellement «en situation».
- Le troisième défi: «vendre» une formation à des enseignants qui n'ont pas l'habitude «d'acheter» une formation.

Ces défis, nous les avons relevés avec un certain succès, du moins pour cette première formation à distance à destination des enseignants du 1er degré, si l'on en juge par le nombre d'inscrits – près de 200 là où n'en attendions que 100 – et leurs réactions toutes très positives tout au long de cette formation.

Cependant, la question du «tout en ligne» a été nécessairement posée au moment de la conception. Nous avions, à ce moment-là, commencé la mise en ligne de formations destinées à un public très différent et nous étions prêts, techniquement mais aussi intellectuellement, à concevoir une formation en ligne pour les enseignants du 1er degré. Pourtant, ce n'est pas le choix que nous avons fait.

En effet, il nous est apparu très vite qu'un nombre encore assez important d'enseignants du 1er degré - public que nous connaissons bien – n'utilisaient pas les TICE dans le cadre de leur travail et en tout cas pas de façon courante. Il était donc risqué pour nous de proposer une formation en ligne à un public qui avait, a priori, quelques réticences. Par ailleurs, la nature même de cette préparation nécessite plusieurs allers retours entre le cours et la cassette vidéo qui l'accompagne et il n'est pas certain que ce public puisse aller de l'un à l'autre, prendre des notes, revenir en arrière, etc. avec beaucoup d'aisance.

Nous avons donc décidé de proposer une formation nouvelle et innovante sur le fond (la création même de cette formation à distance était en soi une innovation) et relativement traditionnelle dans la forme. Dans la foulée les deux autres formations ont été conçues sur le même modèle, à savoir:

- un cours «papier»;
- une vidéo (un DVD) pour illustrer les mises en situation;
- des devoirs «papier».

En revanche, nous avons souhaité proposer des «services en ligne» à partir d'un site Internet spécialement dédié à ce public (les enseignants du 1er degré) et ce département de formations (les formations initiales et continue des enseignants du 1er degré), services directement et facilement accessibles.

C'est ainsi que le site qui sera «ouvert» à la rentrée proposera plusieurs rubriques liées à l'actualité du métier, celle des examens que nous proposons de préparer et un tutorat électronique qui permettra à tout «inscrit» de poser des questions à propos de la formation qu'il a choisie, de l'examen qu'il prépare, de sa «scolarité» au Cned, etc. et d'avoir une réponse personnalisée et étayée dans les 48 heures maximum.

Il n'en reste pas moins qu'après cette série de trois formations importantes proposées dans un temps relativement bref aux enseignants du 1er degré, et dès lors que nous déciderons de la création de nouvelles formations à destination de ce même public, il faudra nécessairement se poser la question du média utilisé.

Je ne crois pas qu'une formation «tout en ligne» serait attractive pour les enseignants du 1er degré. Le rapport au «cours papier» est encore tel aujourd'hui qu'on ne peut s'en passer. On peut se demander d'ailleurs s'il est utile ou nécessaire de s'en passer.

Je crois en revanche que nos futures formations pour les enseignants du 1er degré devront proposer un «cours papier», repère incontournable, et des compléments en ligne, compléments qui ne seront pas seulement des services mais des éléments du cours pour lesquels l'interactivité vient apporter un plus.

Si les enseignants en général et ceux du 1er degré en particulier sont des utilisateurs de plus en plus engagés des technologies de l'information et de la communication, ils restent cependant prudents quant il s'agit de les utiliser de façon exclusive. C'est vrai dans le cadre de leur enseignement, mais c'est vrai également dans le cadre de leur autoformation.

Si nous devons renforcer notre offre de formation en ligne à destination des enseignants du premier degré, nous devons cependant rester prudents et ne pas nous fourvoyer en tombant dans les excès de ce qui pourrait apparaître comme une mode.

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LES NOUVEAUX METIERS DE L'ENSEIGNEMENT «LA CORRECTION ELECTRONIQUE»

Bernard Morvan, Directeur de l'institut du Cned de Rennes, France

Résumé/abstract

The proposed presentation studies the tension between the modes of assessment and validation by means of traditional set exams (like the baccalaureat in France), where very few or no ICT are involved and the possibilities offered by ICT for the development of new ways for distant learners to submit their own work and have it assessed by tutors and evaluators ("correcteurs" in the case of the French national centre for distance education – CNED). Economical and logistic issues are tackled, among them the scalability of ICT based services in distance education as well as pedagogical aspects, and an emerging job profile, "e-evaluator".

The presentation can be made in French with English support.

Introduction

La carte des formations du Cned, opérateur francophone d'enseignement à distance, propose 3000 produits différents. Bon nombre des cours sont en ligne et sont téléchargeables. Cependant, même si certains cours «phares» ont été conçus et scénarisés pour permettre un apprentissage interactif (dans le cadre notamment de l'opération des «Campus numériques»), même si sur le marché très concurrentiel du soutien scolaire le Cned affiche de solides ambitions, la majorité des cours en ligne, et ce pour de simples raisons économiques, est constituée de cours téléchargeables au format Pdf.

C'est que le Cned a choisi d'investir prioritairement sur le développement des services aux inscrits et met notamment l'accent sur le suivi et l'accompagnement individualisés. L'évaluation des travaux d'élèves, la correction des «devoirs»[1] qui participent à ce suivi au même titre que les tutorats téléphonique ou électronique, renvoient très explicitement au paradigme traditionnel de l'enseignement en présence. Nous verrons toutefois que l'organisation de ces services à une dimension industrielle impose une démarche qualité.

Cette qualité se décline sur tous les plans: logistique, technique et surtout pédagogique.

Le seul institut de Rennes a 5000 inscrits résidant à l'étranger[2] dans des pays où très souvent l'acheminement du courrier est défaillant. L'Internet apporte plus de facilités et de réactivité. C'est la raison pour laquelle l'institut s'est résolument engagé depuis 5 ans sur la voie de la correction électronique. Le passage à la correction électronique pose évidemment la question de l'évolution du métier d'enseignant dans l'une de ses dimensions essentielles au Cned.

Comme on le verra, l'objectif premier était de gagner du temps, de réduire les délais. Cette maîtrise du temps aura été et reste la préoccupation principale.

Quelques chiffres pour définir le contexte:

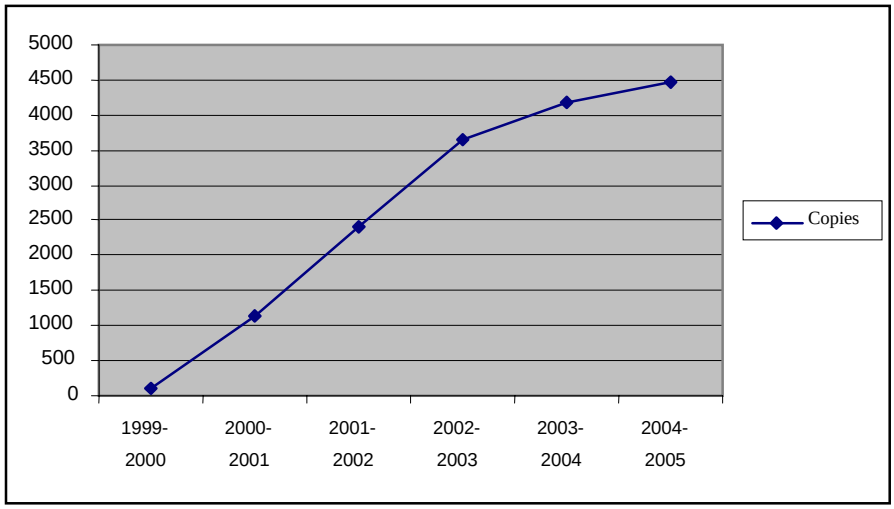
L'institut Cned de Rennes corrige environ 330 000 devoirs d'élèves par an (cours d'été compris), soit 269 000 hors cours d'été.

[1] Ce terme est ici générique, il couvre toutes formes de travaux et productions d'apprenants

[2] Les usagers de la correction électronique ne sont pas les seuls élèves résidant à l'étranger : en réalité 2/3 résident en métropole, 1/3 à l'étranger.

Le nombre annuel de copies électroniques est le suivant:

1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005
108	1142	2395	3660	4184	4468



L'acheminement postal traditionnel reste fortement majoritaire. Ces chiffres montrent que les élèves restent attentistes ou frileux alors même que ce type de transmission et de correction de devoirs Internet leur est proposée dans la plupart des disciplines.

Nombre de disciplines concernées:

1999-2000	15
2000-2001	18
2001-2002	26
2002-2003	30
2003-2004	33
2003-2005	36

Avantages logistiques de la correction électronique

Il fallait réduire la durée du cycle de la copie. Un devoir papier (ou une cassette audio)[3] transite deux fois dans le service de gestion des copies: une première fois pour être enregistré, attribué et envoyé à un correcteur (les correcteurs travaillent à domicile, les flux bi-hebdomadaires sont à réguler puisque le calendrier individuel de travail est totalement libre), une deuxième fois pour le contrôle qualité et pour l'enregistrement de la note. Du fait des délais d'acheminement, le cycle moyen de la copie papier oscille entre deux et trois semaines. C'est souvent jugé trop long par les usagers. Via l'Internet, ce délai peut être sensiblement réduit à 3 ou 4 jours ouvrables selon la disponibilité et la réactivité des correcteurs. Dans les cas les plus favorables (4,7%), des devoirs reviennent chez l'inscrit le jour même de leur envoi.

La transmission électronique permet en outre de sécuriser les échanges. Lors d'un envoi de copie papier, si un accident se produit (perte, destruction, vol, défaillance du service postal), il est rarement possible de récupérer le travail perdu, sauf si l'inscrit a gardé son brouillon, ou s'il a photocopié son devoir avant expédition. Le support informatique assure souplesse et fiabilité. On change la nature de la relation: l'élève conserve son fichier source et peut donc réitérer l'envoi an cas d'aléas. Il s'agit d'une relation de partage sans cession définitive. L'avantage de la numérisation du document, c'est bien sa reproductibilité.

[3] L'utilisation des cassettes est appelée à disparaître du fait des progrès techniques et de l'évolution des équipements domestiques. Mais jusqu'il y a peu, elles constituaient le vecteur obligé de transmission des devoirs oraux.

Les premières années de l'expérience, le Cned ne disposant pas d'un outil dédié, les devoirs parvenaient au Cned par messagerie électronique, sous forme de fichiers attachés. Fonctionnellement, le vecteur Internet prenait le relais du fax et améliorait la qualité des documents transmis. Notons qu'encore aujourd'hui certains élèves continuent à utiliser la voie du fax surtout en fin d'année scolaire lorsque le contexte est à l'urgence à la veille des conseils de classe. Qu'il s'agisse de fax ou de copies en fichier attaché, le modèle organisationnel est peu différent de celui du circuit papier: il implique des manipulations nombreuses en scolarité. L'intérêt que l'élève trouvait au service c'était sa rapidité sans qu'il faille pour autant minimiser les difficultés de saisie.

Dans la version actuelle de Corélec[4], il s'agit plutôt d'échanges d'informations que de manipulations de fichiers. Certes ceux-ci sont téléchargés et mis à disposition sur un serveur, mais par simple clic sur le bouton ad hoc d'une page web; dès lors, le service gestionnaire (service de scolarité) reçoit non le fichier, mais l'information de la présence du devoir à corriger, et il se contente d'attribuer la correction et d'informer le correcteur, l'invitant à se connecter lui-même pour récupérer le devoir, là encore par un simple clic. Faire circuler de l'information est plus facile, le système prenant en charge la logistique des transferts. La gestion des notes étant également automatisée, le progrès est notable!

Un observateur extérieur pourrait facilement imaginer qu'un lien direct élève/correcteur serait plus «naturel». Pour l'en dissuader, rappelons que les correcteurs du Cned sont disséminés sur tout le territoire[5] métropolitain et qu'à l'institut de Rennes on veille à la stricte application du cahier des charges de la correction.

Ce cahier des charges est en effet une assurance qualité pour les usagers. Indépendamment du protocole de traitement de la copie, il définit un état d'esprit, prescrit une manière de faire, établit des barèmes afin d'assurer cohérence et rigueur au service de correction et donc harmoniser les pratiques. Le passage de la copie en scolarité permet de prélever les échantillons destinés au contrôle. A une échelle industrielle, il est nécessaire de viser la constance dans l'observation des objectifs qualité. L'humain est très présent bien évidemment mais il ne doit pas trop interférer avec les standards que le correcteur doit respecter.

Antérieurement, le contrôle qualité pouvait parfois retarder le retour des copies chez l'élève. L'outil Corélec permet dorénavant de conjuguer sans rétention préalable la correction et le contrôle de la correction. Tous les gains de temps sont importants.

Des devoirs de forme traditionnelle

La forme des travaux d'élèves est restée jusqu'à présent strictement identique à ce qui se faisait antérieurement sur papier et les formes de l'évaluation n'ont pas changé. Ce n'était pas la priorité[6].

Difficile d'ailleurs de faire autrement alors qu'il est impératif de préparer les inscrits à la composition d'examen où les épreuves sont codifiées, les types de devoirs strictement normalisés. Dans l'enseignement français ce sont souvent les modalités des épreuves finales qui dictent la pratique pédagogique[7].

[4] Corélec est une application «maison» dédiée au transfert et à la gestion des devoirs. Corélec 1 a été expérimenté à l'institut Cned de Lyon. Corélec 2 est la version étendue à l'ensemble de l'établissement.

[5] Qu'ils soient personnels nommés ou vacataires, les correcteurs corrigent à domicile.

[6] En partenariat avec France Télécom, il y a quelques années, l'institut a testé des outils de saisie d'exercices de langues vivantes dont la conception était spécifiquement adaptée à l'outil dans le cadre d'une campagne des cours d'été. C'est bien sûr une voie séduisante mais coûteuse en développements et parfois difficultueuse quant à l'appropriation technique. Dans sa démarche actuelle de création de produits de soutien en ligne, le Cned a modélisé 9 outils types susceptibles d'être exploités pour des exercices interactifs en ligne: QCM, surlignages, déplacements de phrases à l'intérieur d'un texte, compréhension de l'oral etc. Ces outils seront les briques d'activités destinées à consolider des acquis, à combler des lacunes. On voit mal pour autant ces exercices remplacer les épreuves codifiées qui préparent aux examens.

[7] Malgré ces contraintes, des pistes intéressantes sont à explorer notamment celle de la rédaction collaborative qui privilégie l'évaluation formative plutôt que sommative, qui suppose que l'enseignant accompagne son élèves dans les différentes phases de construction du devoir.

Toutefois sans modifier la nature des exercices, il est toujours possible de mettre en œuvre des formes de travail assisté/collaboratif où l'enseignant suit l'élève dans la réalisation de son devoir, il en valide les étapes, l'accompagne dans ses ébauches successives de rédaction. La correction joue alors un rôle formatif plus net. La mise en œuvre d'une telle procédure progressive a bien sûr un coût et exige une adaptation des outils de suivi, c'est pourquoi l'institut n'y a pas recours de manière systématique. Seuls les «dossiers personnels» imposés dans certaines disciplines technologiques et en arts plastiques relèvent d'un tel suivi individualisé.

Par ailleurs, la question préalable doit être posée de savoir si l'usage «exclusif» du traitement de texte ne pénalisera pas l'élève le jour des épreuves d'examen. Quiconque possède une bonne pratique du traitement de texte sait en effet que l'écriture y relève d'une dynamique différente du manuscrit. L'auteur a en effet et ce jusqu'au dernier moment, tout loisir de déplacer des paragraphes, d'user du copier/coller, bref de bouleverser l'ordre de sa composition. Les lycéens apprennent encore aujourd'hui à composer un plan, organiser leurs idées avant tout passage à l'écriture. Qu'advient-il s'ils utilisent exclusivement leur traitement de texte en cours d'année et s'ils doivent revenir à la composition manuscrite à l'examen?

L'apparition d'un nouveau métier, celui de correcteur électronique

Bien évidemment, on a vu émerger le statut de «correcteurs Internet» et d'emblée s'est posée la question du recrutement.

Le recrutement s'est fait par sollicitation des enseignants titulaires volontaires, notamment lors des «journées de rentrée». Des candidatures spontanées parviennent aussi à la suite des stages organisés par l'Eifad[8]. Le désir de mettre en œuvre des connaissances fraîchement acquises est alors très fort. Des enseignants vacataires ont largement contribué au service les premières années parce que plus facilement volontaires pour se lancer dans l'expérience.

Une personne ressource (un enseignant) accompagne les collègues en difficulté technique ou hésitant sur les procédures à suivre.

Il a fallu en outre revoir les «barèmes»: définition de la charge de correction pour les titulaires, tarif de rétribution de la copie pour les vacataires. En effet, la correction électronique, du moins à ses balbutiements, est consommatrice de temps bien plus qu'une correction papier ordinaire. La montée en charge conduit aujourd'hui à relativiser les bonifications pour des raisons de contrôle de la dépense et parce qu'il faut bien arriver à banaliser cette pratique. La maîtrise technique acquise au fil du temps, la meilleure adaptation de l'outil réduisent le temps moyen de traitement d'une copie.

Les correcteurs habituels du Cned (enseignants titulaires ou vacataires) ne constituent pas un milieu homogène: différents statuts administratifs, disparités d'âge et d'état de santé (enseignants en réadaptation et réemploi), temps partiel / temps complet. Quant aux compétences en matière de TICE, là aussi l'hétérogénéité prévaut.

Il a donc souvent fallu rassurer, convaincre et former à une nouvelle pratique du métier. De nouveaux modules de formation sont mis en œuvre à l'Eifad, et l'on constate que de plus en plus de professeurs qui ont suivi une formation souhaitent s'investir.

La question de leur équipement figure parmi les objectifs du projet d'établissement. Ils travaillent majoritairement sur des ordinateurs de type PC et disposent d'une version plutôt récente du traitement de texte Word, avec un système d'exploitation généralement de la famille de Windows.

La connexion à l'Internet se fait soit par modem RTC[9], en général à une vitesse maximale de 56 Kb/s, soit par l'ADSL ou les réseaux câblés à haut débit. Il va de soi que ces dernières conditions sont mieux

[8] École d'ingénierie de la formation à distance (au Cned)
[9] Réseau téléphonique commuté

adaptées à la correction de copies, en particulier lorsque les fichiers sont susceptibles d'être volumineux, comme dans les disciplines où figurent graphiques, cartes, etc.

La facilité offerte par le traitement de texte pour introduire des remédiations par copier/coller incite certains correcteurs à développer leur correction, et ce sans investissement en temps important par rapport à une correction traditionnelle. Certains se constituent en effet des bibles de paragraphes types. On progresse sensiblement ainsi vers une individualisation plus grande de la relation entre l'élève et le professeur. Tous les additifs pré formatés sont ainsi ajoutés en tant que de besoin et enrichissent les commentaires du professeur.

Les outils du correcteur électronique constituent une palette variée et les pratiques observées montrent une grande diversité des usages. Certains privilégient les interventions sur le texte, d'autres les annotations marginales. Il est possible de surligner, souligner, barrer, mettre en couleur des éléments du texte. Dans la marge, le commentaire est plus ou moins codé. Le jeu des couleurs est fréquemment utilisé pour plus de lisibilité.

Certaines corrections se caractérisent par une grande sobriété et privilégient le texte, d'autres par la charge, voire la surcharge en commentaires.

L'avantage absolu de cette correction électronique est la lisibilité du devoir renvoyé à l'élève.

Quelques obstacles techniques

Dans le contexte précité, le traitement de texte est le passage obligé de la transmission par l'Internet de devoirs sauf à abuser du scanner. Ni les élèves, ni les professeurs du Cned n'ont les mêmes habiletés ni des équipements homogènes. On ne s'appesantira pas trop sur les obstacles techniques régulièrement rencontrés. Elèves et enseignants ont doivent faire face à des difficultés multiples avec des systèmes d'exploitation récalcitrants, des traitements de texte incompatibles, des fichiers perdus par suite de fausses manœuvres etc. Certains ont parfois dû ressaisir leurs productions non sauvegardés. Dans ces domaines, la bonne volonté ne suffit pas, il y faut en sus de l'habileté et un minimum de méthode! La multiplication des obstacles techniques peut être dissuasive.

Bien évidemment, d'une discipline à l'autre les problèmes sont différents. Ainsi, des disciplines comme la philosophie, le français qui exigent uniquement des productions textuelles dans la langue véhiculaire ne créent pas de soucis majeurs. Des consignes techniques claires, recommandant l'utilisation de polices standard, et une mise en page normalisée font que la saisie n'est pas pénalisante et facilite à l'évidence la lecture de la copie[1011].

Il faut cependant résoudre les problèmes suivants:

Utiliser des polices spécifiques pour certaines langues (chinois, japonais) La gestion de différents formats de fichiers de traitement de texte, issus de machines diverses est parfois source de difficultés. Des pannes de serveurs peuvent provoquer le découragement lorsque la compétence technique n'est pas toujours à la hauteur du «défi technologique».

L'augmentation significative ne pourra se faire que si globalement le niveau de compétence monte, concomitamment avec le niveau des équipements en haut débit et aussi avec l'amélioration de l'ergonomie des outils.

Scanner puis insérer des images avec les problèmes que cela pose (augmentation parfois catastrophique du poids du fichier)

[10] Pour autant, l'institut ne s'est pas encore donné les moyens de comparer les notes obtenues pour la correction en ligne avec les notes des corrections papier.

Réaliser des tableaux, des dessins, des schémas, des cartes, comme en SVT ou en Physique-Chimie, en Histoire-géographie

Utiliser/insérer des formules mathématiques $x1 = \frac{-4 + \sqrt{24}}{2(-2)}$ etc.

Conclusion

L'expérimentation a permis d'introduire progressivement la correction électronique dans la pratique des correcteurs. Pour tout enseignant qui découvre l'enseignement à distance, c'est doublement d'un «nouveau métier»[12] dont il s'agit:

- l'acte de correction dissocié de l'acte de transmission orale comme il se pratique depuis longtemps en EAD oblige l'enseignant à reconsidérer son rapport à l'élève. En effet, il n'est plus que l'un des acteurs (pluriels) de l'acte pédagogique et doit donc se soumettre à une discipline, respecter des cahiers des charges stricts et précis. Il n'est donc plus le «seul maître à bord».
- on lui demande ici d'utiliser des outils nouveaux auxquels il doit s'adapter et qu'il doit réussir à maîtriser coûte que coûte sinon le risque est grand de pertes de temps et de manque d'efficacité. Bien évidemment, il n'a pas trop le choix car il sent bien qu'à terme l'évolution est inéluctable. Les générations actuelles d'enseignants concernés ne sont pas nées avec les TICE et l'effort d'adaptation et de conversion à consentir est important. On ne peut que se réjouir de voir que ça marche.

[12] C'est un raccourci linguistique. On devrait parler de nouvelle manière d'exercer le métier.

CAN TEACHERS BE TRAINED ONLINE?

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Abstract

This paper describes the establishment and delivery of a Blended Learning Higher Diploma in Education, being a professional qualification for Primary School teachers in Ireland. This innovative course represents a major departure from the traditional mode of delivery of teaching training in Ireland. A careful analysis of student feedback and examination scores is therefore of crucial importance to inform further development of the course and to contribute to innovation in teacher training both in Ireland and internationally.

The two primary modes of course delivery, that is an Entirely Online mode and a Blended Learning mode, were compared in terms of qualitative feedback from the students themselves and quantitative results from the formal assessment procedures.

Across a range of questions that covered perceived workload, satisfaction with objectives and learning outcomes and perceived career benefit, the mode of delivery had no effect on student levels of satisfaction with the course. There was a small but significant grade improvement for Blended Learning courses over Entirely Online courses. However, alternative hypotheses make it difficult to attribute this grade increase to the mode of course delivery.

The mode of delivery of course content does not affect student satisfaction or the ability of students to perform well in formal assessment. It is therefore concluded that a blended learning educational system that includes online education is a highly appropriate mode for the training of primary school teachers.

Background

Prior to 2003, all primary school teachers in Ireland were trained by established Colleges of Education in full-time, onsite undergraduate and postgraduate programmes. However, these Colleges were unable to provide sufficient teachers and by 2003 a shortfall of up to 2000 qualified teachers had been identified. Hibernia College designed and developed a Blended Learning solution to help address this shortfall. This innovative new course represents the first time that online education has been the corner stone of professional teacher training in Ireland.

The Higher Diploma in Primary Education (HDPE) is a HETAC accredited qualification and recognised by the Irish Department of Education for the purposes of becoming a primary school teacher in Ireland. In August 2005, 1250 new Irish primary school teachers graduated in Ireland. Over 400 of these are Hibernia College graduates.

Hibernia College

Hibernia College is an online College, based in Dublin, offering online and Blended Learning degrees to students in Ireland, the UK and internationally. The College currently serves over 2000 students in 26 different countries and employs over 250 full time and part time staff and faculty. Hibernia College is accredited by the Higher Education Training Awards Council (HETAC), the Irish government's agency for accrediting higher education. Hibernia College adheres to approved Quality Assurance Standards awarded by HETAC following scrutiny by an international review board of distinguished academics and education administrators. HETAC awards are recognised internationally and are accompanied by the EU Diploma Supplement.

Higher Diploma in Primary Education – Delivery Modes

The HDPE consists of 13 modules taught through a range of delivery modes as described in the following table:

	Asynchronous Multimedia Content	Live online tutorials in the Virtual Classroom	On-Site Face to Face tutorials/ workshops	Asynchronous Discussion Forum	Example Module
Entirely Online	X	X		X	Psychology of Education
Blended Learning	X		X	X	Teaching Methodologies
Entirely Onsite			X		Teachers and the Law

In total the number of hours of student effort consists of 55% online and 45% in a face to face environment.

For the purposes of this study the following courses are classified as Entirely Online:

- Psychology of Education
- Philosophy of Education
- Sociology of Education

The following courses are classified as Blended Learning:

- Teaching Methodologies English
- Teaching Methodologies Math
- Teaching Methodologies Irish
- Teaching Methodologies Geography
- Teaching Methodologies History
- Teaching Methodologies Science
- Religion
- Physical Exercise

Dependent Variables

In this preliminary paper, we report data derived from a sample of the questions answered by students in student feedback forms. Student appraisals and assessment and examination performance in Entirely Online courses and Blended Learning courses were compared under the following headings:

A. Satisfaction with Aims and Objectives and Level
B. Satisfaction with Workload
C. Benefit as a Teacher
D. Final Grade

Results

All student feedback data was collected on a standardised questionnaire presented to all students at the end of each module. Questions consisted of 5 point Likert scale items (Strongly Agree, Agree, Neither Agree nor Disagree, Disagree and Strongly Disagree) with free text feedback available (not reported in this paper) at the end of each section. Questionnaires were presented either in a paper and pencil format during workshops or via an online survey. Mean response rate was 28.14%

Formal assessment data was collected for continuous assessments and for terminal examinations by the Office of Academic Affairs. This paper presents mean overall grade score in percentages for each of the independent variables.

A) Satisfaction with Aims and Objectives and Overall Level

Students were asked if the aims and objectives of the module were clearly stated at the outset and if the module content enabled them to achieve the stated learning outcomes. In both cases the modal response for both Blended Learning and Entirely Online courses was "Agree". Chi-squared analysis showed no significant difference between the groups for either item (χ^2 = 1.01 and 1.38 respectively, df = 4). Students were also asked if the module began at an appropriate level. The modal response for both groups was "Agree" (χ^2 = 2.40, df = 4).

B) Satisfaction with Workload

Students were asked if the workload was acceptable and, in a separate question, if the course was more onerous than other courses. The modal responses for both the Blended Learning courses and the Entirely Online courses were "Agree" and "Disagree" respectively. Chi-squared analysis showed no significant between the groups for either item (χ^2 = 3.80 and 7.59 respectively, df = 4).

C) Benefit to Career as a Teacher

Students were asked if they felt the course would benefit them in their forthcoming career as a teacher. The modal response for courses taught through Blended Learning was "Strongly Agree" (n = 47), while the modal response for courses taught Entirely Online was "Agree" (n = 34). However, this difference was not significant (χ^2 = 7.60, df = 4).

D) Final Grade

196 students' final grades in courses taught through a Blended Learning mode were compared with those taught Entirely Online. Students consistently scored higher under the Blended Learning mode with a modal increase of +2 percentage points. Only 15 of the 196 students obtained a lower score in the Entirely Online courses. Mean score for Blended Learning courses was 59 ± 0.43 compared to 58 ± 0.45 for Entirely Online courses. This small difference was significant when compared using the Students' t-test ($p = < 0.001$).

Discussion

We assessed qualitative feedback from students enrolled in a Higher Diploma in Primary Education. Feedback was obtained in reference to Blended Learning course modules and Entirely Online course modules. Across a range of questions, students reported a similar level of satisfaction with the learning outcomes of the courses, the workload involved in the courses and the perceived benefit to the student in their future career. These preliminary findings strongly suggest that the mode of delivery of academic content in a Higher Diploma in Primary Education does not affect students' reported satisfaction with the individual course modules. We are currently analysing more extensive data from an additional 200 students who have completed their examinations in August 2005.

We also analysed final examination grades of 196 students in Blended Learning course modules and Entirely Online course modules. Although small, there was a significant increase in final grade for Blended Learning courses as compared to Entirely Online courses. However, we are reluctant to attribute this increase to the mode of delivery since several alternative hypotheses are more compelling explanations including the difficulty of the course content and the leniency/harshness of the markers. A new intake of students begins the Higher Diploma in Primary Education in October 2005 and we intend to attempt to eliminate these alternative hypotheses by assigning half of the students to Blended Learning and half to Entirely Online in the SAME course module.

Conclusion

Hibernia College has designed a mixed delivery education system conforming to international best practice and accredited by Ireland's qualifications awarding body for third-level educational and training institutions outside the university sector. This award is recognised by the Department of Education for the purposes of becoming a primary school teacher.

This innovative course is a departure from the traditional mode of delivery for teacher training in Ireland, that is full time, on-campus delivery. Individual course modules are delivered primarily via Blended Learning or Entirely Online. This paper demonstrates that the mode of delivery of course content does not affect student satisfaction or the ability of students to perform well in formal assessment. It is therefore concluded that a blended learning educational system that includes online education is a highly appropriate mode for the training of primary school teachers.

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WHY ARE POLISH TEACHERS RELUCTANT TO DO E-COACHING? E-COACHING IN POLAND

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Introduction

E-learning in Poland is a relatively new phenomenon, and as such it is rather difficult to describe, let alone evaluate. Nevertheless, one may attempt to investigate certain aspects of its functioning, and view them in the context of people who are to deliver online courses. This paper functions as an outline of the situation of e-learning and e-teaching in Poland, as well as an analysis of potential reasons for the fact that Polish teachers are reluctant to do e-coaching.

Polish attitude towards innovation and training

One of the factors that may shed some light on the situation of e-coaching in Poland is the social attitude towards technology. According to research conducted by the European Commission in 2005, Polish people are rather conservative in their attitude towards innovation and modern inventions. *Europeans, Science and Technology 2005*[1], as this is the survey I am hinting at, revealed that Polish society does not consider science to be a subject worth their attention. In the research, respondents pointed to such areas as culture, sport and politics as those provoking more interest than science and technology (culture- 63%, sport-54%, politics- 44%, science and technology-43%).

This seems to explain why scientific findings are not of primary importance to the general public in Poland. If we focus our attention on such areas as the innovation relating to the Internet, we will find that in 2003 *Eurobarometer* only 26% of respondents considered this field of science worthy of their interest, which resulted in the positioning of this area far below ecology (47%) and medicine (43%). This only proves the hypothesis that Polish people are not as keen on trying out new developments and implementing them in their work and life as their European counterparts. 30% of Poles declare zero interest in matters of science and technology, whereas the EU average in this respect is 21% (only 21% of Poles perceive themselves as very interested in science and technology- the figure being 30% in the EU).

Similar results are to be found in the *Strategy for the Development of Constant Learning* issued by the Ministry of Education and Sport in 2003, yet this time they cover the field of self-development and training. The Ministry complemented the document with statistics on this issue, and claimed that whereas in the EU 20% of people invest their time into self-development, in Poland this number is much less considerable, and amounts to 9%[2]. This disparity is even more visible when comparing Poles and Western Europeans in terms of time devoted to organized training. We spend no more than 2 hours annually learning in an organized way, whereas in Europe this figure is 30 times higher, as the Europeans spend 60 hours each year developing their skills. This seems to prove that even though according to Micheal Yacobian (internationally renowned trainer) '*people love to learn but hate to be taught*', in Poland neither part of his statement applies yet.

Such attitude towards innovation and training is bound to influence the minds and methods of educators, who interact with others on a daily basis, not to mention that they are also a product of the old education system. Nevertheless, it would be naïve to think that these are the sole two factors responsible for their unwillingness to introduce elements of distance teaching into their courses.

[1] *Europeans, Science and Technology 2005*, survey requested by Directorate General Research and organised between January and February 2005.

[2] *Strategy for the development of constant learning*, issued in 2003 by the Ministry of Education and Sport.

E-learning in the corporate sector

E-learning in Poland has become present in two major sectors: that of higher education, and that of business. Consequently, the e-teaching takes place in these two environments far more frequently than anywhere else. Let us then analyse the benefits that arise from the fact that public sector and from individual companies (usually foreign invested) are seeking to upgrade the skills of their workforce in the form of online courses.

It seems that large and medium-sized private companies in Poland are learning that training programs are an investment. The key to success in the private sector is to have courses that can be given on short notice and at the convenience of the client. These courses have to be tailor-made according to customers' technical, management, language and financial situation.

An emerging niche is e-learning and multi-media training. Several of the leading training companies are currently starting to offer courses via local Internet service providers. The preferred courses are those that meet specific professional needs. The main market for this segment is corporate training. In the near future e-learning and multi-media training are expected to become a critical training medium. During implementation process no one thought of the company's costs of integrating the solution with the workers development culture. Among everyday duties of highest priority, even the resident courses are put off for later. When the system changes into "learning anytime and anywhere" it often means "never and nowhere", which means that e-teachers are faced with results that are not proportional to the amount of time they spent developing the course. Corporate sector, however, is most willing to try out new methods, and take the risk of introducing them into their companies-mostly because those in charge have had personal experience connected with e-learning.

Technical background

Another explanation for a relatively low popularity of e-coaching among teachers may be linked to a much more trivial aspect of Polish reality. The reasons behind pessimistic statistics presented in the previous sections may stem from the simple lack of the resources. Polish schools have problems with getting funds for computers, and this is why one of the most pressing needs of the Polish informatisation bodies is to equip public schools with proper tools for CBT. This problem is gradually being dealt with, and the advantageous results are already visible. According to IAB 23,5% of Polish society has internet access (June 2005[3]), which is a considerable improvement when compared with the data presented in the portal *elearningeuropa.info* in 2003. The aforementioned research stated clearly that only 14% of Polish society has access to the Internet. This means that teachers who are somewhat reluctant to engage into open and distance education, may be experiencing discouraging problems with technical resources, rather than just conservative fears of the unknown.

E-phenomena in Poland

Numerous publications clearly define that Poland needs to improve the scale of public services available online. Such spheres as e-commerce, e-health, e-government have been enumerated in the *ePolska* document that constitutes the strategy for the computerisation of Poland. The paper, issued in 2003, presented data that place Poland against the member states of the EU15. In terms of the degree of the public services offered electronically/online, Poland came penultimate, and was given almost four times fewer points than the leader of the ranking (Ireland). Therefore, a number of government initiatives have been conceived in order to improve that situation, most of which are referred to in this paper.

One of the worrying aspects connected with the popularization of e-learning boils down to the fact that there are legal barriers to the development of the e-learning and online courses. Polish online studies are not regulated by any acts of law (in the Act of Higher Education there is no mention of virtual learning). Therefore Polish people do not treat online studies seriously, as they lack this

[3] *Co czwarty Polak to internauta, (One in four Polish people is an Internet user),* E-gospodarka.pl, 8 July 2005.

official recognition by the government. “The status of distance education in Poland is located between an experiment and supplementary method of teaching and learning”.[4] One of the reasons given for this state of affairs is that it is impossible to verify knowledge acquired in this manner. This works as yet another factor contributing to the cautiousness of Polish teachers and mentors when faced with the possibility of teaching online, thus devoting their time and energy to developing materials and courses that are not to be perceived as having full educational value.

Changes in the teacher function

There are other factors that need to be taken into account when analysing the status of online courses and e-teachers in Poland. They are linked to the fact that teachers find that social and psychological skills employed successfully in traditional teaching, in e-coaching lose their usefulness, as there are different circumstances accompanying the teaching process. They include such aspects as the distance, lack of eye contact, being limited to the verbal stratum of communication, high speed of transfer, large number of disruptions stemming from numerous faults of the tool itself and/or the recipient (*Changes in the teacher function resulting from e-coaching).* They all make the teachers’ job of transferring knowledge more demanding and difficult. E-coaches are expected to prepare their students to the difficult task of living in the information society, as well as instructing them in their own fields of knowledge. They are to be planners, organizers and teachers, which means that quite a lot is demanded on their part. Such a strain is not something that every teacher is ready to accept.

Why is e-coaching unpopular?

In Poland distance education has been present for quite a long time, but is still neither popular, nor commonly applied. In the research conducted by Elżbieta Gajek in the Computer Assisted Education and IT Centre in Warsaw only 20% of teachers of different subjects admit that they have experienced some form of distance education, with 17% of them declaring reluctance towards this form of learning. One of the most prominent arguments against e-teaching quoted in the survey is lack of personal contact that it involves.[5] It is clearly visible that Polish teachers are used to the traditional way of transferring knowledge and are unenthusiastic when it comes to changing them.

This may be somewhat justified by the fact that not infrequently the teachers are left to their own resources and imagination, when it comes to adjusting their methods to teaching online. They cannot count on the assistance of their schools management who lack resources to organise the necessary training or change the school structure to incorporate e-learning solutions more. Financial arguments appear to recur in the discussion about the failure to introduce e-learning into schools on a wide scale. The other repeatedly indicated factor impeding the development of ODL in Poland points to the inadequate education of our society, as there are still many people who do not even know what e-learning or distance learning is. Teachers are often found to belong to this group, but surprisingly enough they do not use the opportunities of extending their knowledge in this respect.

A good example illustrating this hypothesis is provided in the article entitled “(Un)necessary courses of e-teaching methodology” by Elżbieta Gajek. The author describes the factors she considers responsible for lack of popularization of e-teaching in Poland[6]. She bases her opinion on the experience connected with the failure of the courses on the subject that the Computer Assisted Education and IT Centre in Warsaw has had in its offer for over 2 years. In this space of time there was not a single teacher that has enrolled for the course. She divides the factors contributing to this situation into 6 categories:

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[4] *Zmiany funkcji nauczyciela w nauczaniu na odległość, (Changes in the teacher function resulting from e-coaching*), Ewa Lubina, E-mentor, 6/2004.

[5] *Nauczanie języków online, (Teaching languages online),* Elżbieta Gajek, E-mentor, 4/2004.

[6] *(Nie)potrzebne kursy metodyki nauczania online, (Un)necessary courses of e-teaching methodology),* Elżbieta Gajek, E-mentor, 7/2004.

- professional: teachers have no chance for implementing that knowledge in their work
- investment-related: no return on their investment, they would have to pay for their own training
- political: no legislation covering ODL
- cultural: no tradition of e-coaching, little belief in its effectiveness, no personal experience of such education
- marketing: little marketing input of such courses
- technical: no e-learning platforms available at the institutions training present and future teachers (even the course on the online couching methodology is conducted in a traditional way).

It is easy to find a link between the situation described above and our experiences in the field of language training (as this is the specialisation of our company). The results of the questionnaire we conducted at the beginning of 2005 clearly show that language teachers in Poland are not ready to face the challenge constituted by ODL or CBT. 90% of our respondents had no experience of working with e-learning tools for teachers. 71% of them declared that they would wish to implement such resources into their teaching method, yet 23% stated definitively that they consider it unnecessary and ineffective, therefore have no intention to try e-teaching at any point in their career. 6% of the respondents admitted that they do not have a clear opinion on the subject. This is consistent with the opinions appearing in numerous publications on the subject, namely that despite initial fear and inhibition demonstrated by teachers towards this new tool, eventually e-teaching will become commonly used in various fields and subjects.

Perspectives

This view is supported by numerous signals from different environments that clearly set the future of Polish education in the context of e-learning and e-teaching.

First of all, there are more and more institutions that offer specialized courses for teachers who are to conduct online courses. According to many sources, there is a growing popular demand for this kind of training, which means that both teachers and their supervisors have grown to understand the potential behind CBT.

Secondly, Polish government is also working on implementing online services, e-learning being one of them, in various spheres of public life. There are acts and strategies being developed and implemented in order to make this goal possible to accomplish. Some of them are enumerated in this paper, e.g. *ePolska*- a government project for the development of information technology in 2001-2006[7].

Finally, the material situation of many schools and training centres is improving, thanks to government initiatives, as well as sponsors and EU funds. This results in the expansion of possibilities available for teachers, and in turn, to their students.

In view of all these positive changes it is easy to predict that even though at present its status is not yet firmly established, e-coaching will gain popularity and recognition in Poland.

[7] *ePolska Plan działań na rzecz rozwoju społeczeństwa informacyjnego w Polsce na lata 2001-2006*, (*ePolska- Strategy for the development of the information society in Poland for 2001-2006*) issued by the Ministry of Economy.

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EPICT AND THE EDUCATIONAL PSYCHOLOGY OF DISTANCE LEARNING

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Introduction

Distance learning has a relatively short tradition at the oldest and largest teacher training program of the Eötvös Lorand University of Sciences. In 1999, we tried to incorporate methods of distance education to make future teachers acquainted with one of the most interesting methodological novelties of those years. In our MA level teacher training program, we used DL elements in Educational Technology. We approached several university staff members with ideas of turning their disciplines into a DL experience, but they thought it could be as dangerous as the AutoCAD was for the draughtsmen.

We launched our project with the thought: „if you can't stop it, lead it!". In the beginning we had to confront numerous, since then, generally discussed problems concerning motivation, evaluation and staff training. The key to solving our problems was a new concept, the definition: *educational psychology of distance learning*. Of course, the word "psychology" cannot be interpreted in the traditional way, but as the collection of experiences that are deeply human in the environment of computer supported distant learning.

The EPICT consortium has gathered such experience that can also be listed under the category of "psychology". The EPICT course starting in our country in late September 2005, will use these results as well in the teacher training at the ELTE.

My presentation focuses on the realisation of psychologically innovative ideas of EPICT methodology in Hungary. Many of our dreams and aspirations about e-Learning have failed to come true so far, but our experiences show that digital pedagogy /reinterprets/ and at the same time /reinforces/ the role of the teacher – helping him or her to become a knowledge transmitter and EDUCATOR at the same time.

Distance Learning through pink glasses

The ideal student engaged in distance education is constantly enthusiastic, thirsty for knowledge, has no other chores and aspirations than sitting in front of the computer and revising more and more learning materials wearing comfortable home clothes. This student concentrates with unceasing excitement. The student's mind not even wanders off on foggy November mornings and on a sunny May afternoons and cheerfully acquires every information possible for him/her even in the soulless environment of mass education. Never copies other people's papers, because he/she is interested in the topic and the cheating is always discovered.

But reality is hardly as pink as that.

We teach through distance learning because it seems economical, there are numerous rational arguments (free time management paper and printing free methods, saving travel costs), but as experience shows distance learning is also driven by futuristic thoughts. It's hard to tell when and why it doesn't work but in practice lots of problems come up.

A lot of people have no other choice than to participate in obligatory distance learning thanks to some kind of training at work or expectation. In a lot of cases acquiring the certificate is more important

than acquiring the knowledge is the main goal, the knowledge is only secondary aspect or not even an interest. College students like to choose from learning materials presented through distance learning and also achieve it with worse results.

The EPICT methodology has proven to help achieve better results in teacher training – that's why we have focused on this training.

Experience

Our department has taught educational technology to more than 200 students per semesters partially through distance learning. The department has developed numerous methods so we can solve problems that occur while teaching long-distance. The results connected to this will be presented with help of the EPICT methodology.

Ink-saving multimedia

The pretty, flashy, coloured and broad-screened multimedia environment has always had its charm and seemed practical. But for most people it's not so comfortable – and may be that it will never become comfortable either – to read or study from the computer screen. There are ergonomic and physiological reasons as well. We notice the first signs of exhaustion much earlier if are faced with electronic learning material. If one could choose between studying in front of the monitor or rather lying on a comfortable couch, or on a shady spot under a tree in a garden – no one would ever choose electronic training.

Those who insist on using paper-based learning materials, thus start to print feverishly at the work place (or that of a parent's). On one hand the process of printing is always nice, since it's like we're actually acting and performing a learning task. On the other hand, one likes to underline, high-light, border content, write notes on the margins, use green, purple and neon markers. The materials in distance learning are usually not in printable format – they are "littered" with useless and annoying coloured background and pictures. To the costs of distance learning one must reckon also the costs of printing and also the time to transform the texts into printable ones. The costs of the production of paper-based material increase a great deal compared to the printing of large number of editions.

If the use of multimedia is reasonable and the creators of the learning material did not just only want to dispose the costs of printing, then, apart from pretty pictures in the material animations, sounds and movies can also be found in the material. The materials are secured on CD-ROMs by the education centre or can be down-loaded from the internet. Therefore a personal computer is needed with an excellent monitor or computer access somewhere. It's very common that one must travel – sometimes even very far to use an appropriate PC. Subscribing to the internet is a necessity. Transmission speed must also not be over-looked in consideration of the material displayed on the web. These costs (computer, its maintenance, access to internet, travelling) usually depress the student and/or the family.

According to our experience the material in distance learning must be multiplied in a cost-effective way and the students must be granted access, the printable material must also be posted on the Internet. In the EPICT experimental training these criteria are all taken into consideration and all efforts have been taken to realise these guidelines.

Savings on travel

Travelling plays an important role to define oneself as a student and to define one's roles. At home there's family and comfort, at the workplace a man works, in school we're either students or teachers.

We like to enter the school building, climb the broad stairs, grasp the doorknob lying high up, so we feel like a children again, to take a deep breathe of air. And we like to smell the dust of the library,

glance down at the park or the trams. We like to step into an auditorium full of people and noise and wait for the teacher to appear, and meanwhile taking a survey of who wears what. (In the Moodle framework everyone must have a photo-portrait and we encourage learners to change their photos regularly.) We like to trot down to the canteen and eat ham smelling apple pie with coffee poured into a plastic cup. And we not only are fond of it, but it is also a very important social part of the training – just as breaks are in the middle of a conference or the time spent travelling, which allows us to dispose ourselves from the everyday life and to be able to plunge deeply into one specific subject.

Our experiences lead us to believe that it is not an important aim to reduce travelling time.

Motivated students

"You are learning for life and not for the teacher." Although there are reasons why clichés are formulated – one reason is that they are not entirely true. This statement is a very good example. It has been cited many times in many different situations, but in reality most of us continue study the subject taught by his/her favourite teacher. Teachers have determined the life of most people.

It is uncertain for whose sake does a student of a distance learning course actually engages in studies. Of course the character of the teacher is not always the most motivating aspect – but this aspect can be very important especially while dealing with boring and hard to learn topics. Louis Pósa (a world famous math methodologist) is praised highly among his students. The real cause of his popularity is that he can easily throw a piece of paper into the dustbin from the other corner of the classroom. We often admiring someone for trivial reasons. We like having private opinions about teachers.

Based on our observations we may indicate that the personal intonation and the feel of personal encounters has a key role if the blended learning course has only a few face-to-face lessons. In the methodology of EPICT we found important guidelines for that. As facilitators we can really activate a group, but not with the repeatedly mentioned deadlines. The question "Does anybody have a good recipe for apple pie?" can act as a catalyst. To word an answer letter as a facilitator in an EPICT course has especially interesting methodological aspects.

Is it an advantage that student schedule their studies?

Many students are incapable of scheduling their time. Very few of us have ever transmitted our paper two weeks before the deadline. Generally the universities' position on this issue is that students should learn how to schedule – and weekly seminars also aim to help achieve this.

Based on our observations we should have strong milestones every second week with the possibility of failing since students can plan more easily for a short interval. Coincidentally with our results, in EPICT there are also two checkpoints a month – students are required to bring to book for their job two times a month.

Self-supported learning

Most otherwise capable students are not able to learn by themselves. Not because no good libraries exist, or because there's an absence of good instructors and good curriculum, nor because they would not prefer to be sophisticated professionals of the society, and not because they have no time (taken in consideration of the viewing indexes of primitive talk shows).

"It is not good that the man should be alone". We are social creations, so most of us feel neglected without the appropriate social milieu. The "Flow" written by Csíkszentmihályi can help to deeply understand this. It is good to be the part of a team. We like to take care of each other, and we do enjoy if somebody listens to us. We certainly have social needs. We like dressing up to the nines, and examining each other with eyes of a fashion expert. We enjoy socializing friends and networking,

sharing jokes, or at least exchanging thoughts on the weather. Taking part in a group is good just as helping a fellow student sitting next to me. We like scandals during the lessons, and it's always nice to act naughty once in awhile.

The teamwork has a special importance in distance learning. Those kinds of team home works are the most suitable which are not easy to divide up into independent sessions what they can do themselves. The most exciting idea of the EPCIT for us is breaking tradition; it works with methods familiar in military training. It Is the team that can pass or fail the exam and not the individual.

Communication

Students do not only ask questions because they are unable to read an understandable, meaningful, uncomplicated text of about 500 characters, but because it is a nice activity to ask questions and a nice experience to get answers. In general, it is pleasant to interact, to communicate.

Here lies the reason, why in the EPCIT course the letters written by the facilitators are so lengthy, bountiful. Our observations reveal the usefulness of a closed and unmoderated forum for students only in distance learning. Students understand each other easily when they can express themselves without being observed by teacher. It has an importance to keep the group together, to help each other, to dissolve any generated tension. In EPICT, a dedicated forum may be not so important, because the size of the groups is very small so they can chat with each other even without an organised forum.

New layers can be reached with the help of the DL

We can state that nowadays those, who are able to learn with DL tools, could learn in traditional learning environment instead as well. In the EPICT those teachers can also take part who does not have enough self-confidence to take part alone in traditional teaching environment.

If isFree(people.thread) {run(seti.atHome)}

Computers are capable of starting a procedure in the very moment they have finished another one. This is the basic idea of the SETI. The point of the SETI is that the computer does not need a relaxing time, and parallel with a screensaver, different socially useful calculations can be run. Most students can not take part in a DL course in "dead times", but we hope it will be easy in the future. Computers try to shape us to suit their own image, just as well the Stakhanovist tractor driver wanted to resemble the tractor he drove.

If there were an eating tool which could define exactly the grams of protein, fat, sugar, starch, vitamins and minerals we need, our thousand years old eating habits would become similar to a bitter pill. It is possible that such a fare was healthier, cheaper and the uppermost reasonable way of eating, but we would lose the warmth of the family circle at dinner, the happiness of being together, and the culinary enjoyment.

The primary objective of learning is to acquire knowledge, but it can only happen if we feel good while learning. This is why it is perhaps indifferent whether the DL is economic, comfortable, rational or not.

In the character of distance learning it is important to find those methods, which are able to transmit the deeply human factors of teaching and learning. These aspects are the basic for the idea of school in the new medium, ICT. We should fill distance education with soul. It should be fitted to human beings. We are not obliged to find out the whole systems of distance learning, but the optimal knowledge transfer that could not be realised through classical teaching and learning methods can come into existence in this medium. EPICT chalked up many parts of this assignment.

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COMPETENCY-BASED STAFF TRAINING SYSTEM

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The Russian Education Society has made the move towards the integration in the European Education Area, created on the basis of the Bologna and Copenhagen Declarations; therefore it is important to develop realistic strategies for this process, taking into account the peculiarities of our Education Society. Moreover the Russian Education Society has taken a step forward in the implementation of the competency-based approach to employee training, generally recognized in Europe.

1. Competency-based approach principles

Russian enterprises have begun to admit that their main area of differentiation and competitiveness is their people. Each day there appear more cases of business organizations that direct their competitive efforts towards to strengthening their human assets. Generating spaces that promote innovation and lifelong learning are objectives that are supported by training processes aimed at developing labour competencies.

The Institute of Distance Education of Ulyanovsk State Technical University has been taking an active part in the development and implementation of competency-based employee training system in Russian organizations and enterprises. This approach focuses on the following objectives:

- Having more flexible manpower;
- Giving credit and practical support to the concept of continuous training with more flexible and accessible training methods;
- Changing from a supply-side training system into another which reflects the needs of the labour market and responds accordingly;
- Developing a training system that is efficient and profitable, with a well-earned reputation and with the same quality as that of academic training.

Thus our competency-based staff training system includes three stages:

The first stage is the preliminary stage and includes the definition of objectives, strategy; the estimation of aims and values; preliminary analysis of the competency-based employee training system development and implementation and the forming of a team which will conduct a project. The final result of this stage is a selection of the competency model type which is unique for every organization or enterprise.

The second stage builds upon the chosen competency model type. A general scheme of this work can include:

- Investigation of job profiles and job functions within every department;
- Description of business processes for all job functions within every department;
- Sample selection (multiple groups, top performers etc.) and data collection methodology selection (literature review, focus groups, behavioral event interviews, surveys, observations, work logs etc.);
- Content analysis of these sources to develop a list of the competencies required for effective performance in the target job;
- Identification of competencies and competency model creation

The third stage can include different applications of competency models:

- Strategic workforce planning;
- Selection;
- Training and development;
- Performance management;
- Succession planning;
- Rewards and recognition;
- Compensation

The Institute of Distance Education not only facilitates the competency model development and implementation but also develops study programs and course materials and conducts the education process on the basis of competency model usage results.

The education process is built on blended learning which includes the usage of both distance and traditional technologies. Whereas traditional technologies imply conduct of traditional training and role plays, employee training via distance technologies is based on the Complex Automated Management System of the Higher Educational Institution (CAMS HEI).

2. Staff training on the basis of CAMS HEI and traditional approaches

CAMS HEI is a full-scale system, specially generated to manage the activities of Russian higher educational institutions, in particular, the employee training process.

CAMS HEI consists of two multilevel and multifunctional subsystems: an education and training management, organization and technology system (MOT) and an integrated environment for network-based courses development and implementation also called an educational resources technology system (ERT).

The MOT subsystem has the following characteristics and functions.

Learning is provided in a number of institutions using various educational programs in different locations. The structural-logical schemes are used in schedule drafting. To make the most out of the schedule, this subsystem allows prioritisation of different disciplines.

Form templates are used for drafting of final documents. The outcoming Word and Excel files allow the creation of an electronic document archive. The use of employees biographical particulars report constructor provides the requisite documents classified according to specified levels. The variety of existing manuals allows the subsystem to be controlled with ease.

The input information logical control provides the database authenticity. Database information control operating modes are provided. Information selection due to definite criteria determines decision making in the process of subsystem exploitation.

The software has been developed with the use of Visual Studio.NET in C#, Microsoft Access 2000 and Microsoft SQL Server 2000 database management systems; networking process is provided. The existing parole system limits access to data. Context hints and comments in documents have been designed to assist users in their work with the subsystem. Employee archive information organization in a separate database allows to shorten the time for employee information processing.

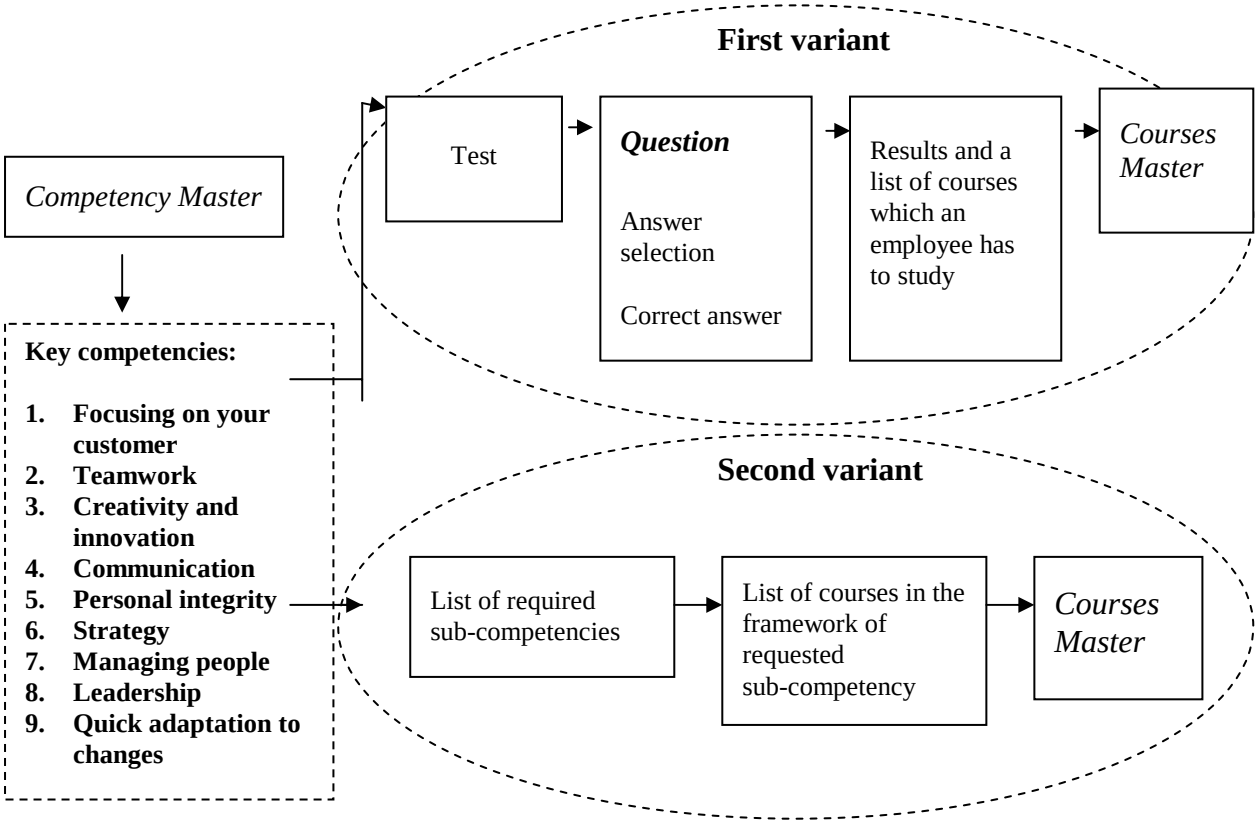
The subsystem has provided automation of the following departments: the admissions office, the dean’s offices, the chairs, the office of the head of studies, the personnel department, the business, bursary and accounting departments.

The MOT subsystem functions allow the creation of a pioneer Internet site. The site contains both information and educational components, provides the process of distance learning materials transmission, educational processes conduct and organization of learning via the Internet.

The functions and characteristics of the ERT subsystem are as follows:

- object-oriented learning materials development;
- learning objects classification;
- object automated design;
- course representation: content, markup and structure search, review and updating;
- storage of the learning materials in the object repositories;
- search engines and authorization systems;
- educational process management (discipline study, educational management, learning outcomes registration, learning interface).

The ERT subsystem provides implementation of the bivariant scheme of employee training. The core scheme units are the "Competency Master" (a combination of methods and means for employee competency testing) and the "Courses Master" (a combination of methods and means for providing courses for the development of the required competencies).



The first variant of the scheme includes a test for every key competency. A test completion report provides a list of courses, which should be learned in the framework of every competency due to the revealed gaps in knowledge. Thus the "Courses Master" provides a list of courses on the basis of results from the "Competency Master".

The second variant of the scheme means that an employee can get, first, a list of sub-competencies in the framework of every competency and, second, a list of courses in the framework of every sub-competency without testing.

The education process results are transmitted to the employee record book, stored in the MOT subsystem, which also monitors the next training dates.

One of the branches of the Institute of Distance Education - Business School “Career” supports an employee educational process by means of training and role plays which facilitate the process of qualitative professional knowledge acquisition.

3. Employee training on the basis of traditional education

Employee training is more easily identified and provided when mechanisms of competency assessment are employed on them, thus facilitating the identification of those competencies that are to be developed in each case, and therefore, the training actions that are required. Many entrepreneurial training programmes often end up with the inefficient formula which, because of its repetitiveness, only manages to provide resources in the form of time and money, but they do not imply further progress with regard to employees.

The Institute of Distance Education of Ulyanovsk State Technical University not only facilitates the competency model development and implementation but also develops study programs and course materials and conducts the education process on the basis of competency assessment.

The Institute of Distance Education is highly involved in the employee training process, which is carried out on the basis of the competency model implementation, traditional training conduct and the Complex Automated Management System of the Higher Educational Institution (CAMS HEI), which, as a whole, stimulates the realization of life-long learning principles.

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EMERGING *LITERACIES, SKILLS AND COMPETENCES*: POSING QUESTIONS FOR FUTURE EDUCATION RESEARCH AND POLICY MAKING IN AN *OPEN CLASSROOM*

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Concepts & Realities

The diversity of the ways the citizen participates in the socioeconomic field as composed by a increasing variety of local and global (national & international) communities/networks, has an impact also on his/her communication practices, the practices that correspond to the building and the negotiation of meaning. This very diversity is each time resulting to a different constituency of values and beliefs, implying the transformation of the solid identity into a variable of changing cultural and social contexts (Isin and Wood, 1999). Nevertheless, these contexts are related with the rights and status of ethno-cultural minorities in multi-ethnic societies (see also the "minority rights-multiculturalism" debate) and the virtues, practices and responsibilities of democratic citizenship (see the "citizenship-civic virtue" debate).

Such an approach and understanding lends to the assumption (pre-supposes) that the citizens have developed the capacity of critical reflection, so that they can perceive the processes of the constant reframing of their actions as well as their own consequences. This presumption places learning (cognition) in the core of every social interaction, while, at the same time, within the constant change of the individual's (citizen's) space, learning could constitute a solid value, a common feature of the new identities (Cope & Kalantzis, 1990) – we could also name them as the *emerging identity profiles*.

Therefore, in terms of any participation to the public political agenda, democracy is defined by a variety of actions by individuals that in their turn demand a variety of *Knowledge, Skills and a wide range of Competences*. These Skills and Knowledge not only correspond to the political rights and obligations as well as to the appearance of the citizen in the public space, but they are also critical as regards his/her participation to the public discourse.

Multi-folded Identities

The bouquet of skills and knowledge is not independent of the practice the members of a society are experiencing, depending on their socioeconomic status. The various social and cultural groups (ethnic, linguistic, religious etc.) are negotiating their position in the contemporary social transformations through specific practices. These practices constitute the identity of the members of these groups and are also apocalyptic of their societal theories, beliefs and values. Therefore, learning and *Literacy*, in the framework of active democratic citizenship is not just the sum of information, knowledge and skills that we have, but more than that, it has to do with the *expansion* of our *personal and social identity profile*. From that we can derive the basic parameters of the modern concept of *Literacy*, which have to do with the formation of identities, the participation to the Learning Society and the Negotiation of Meanings.

It goes without saying that economic growth and the issues of democratic governance are directly connected with the identification of *Literacy* and hence they challenge the so-called "objective", independent of any historic, social and cultural context, sort of a "neutral" scope of life (meaning). From this point of view, in ever-changing occasions and contexts, Literacy is defined in a varying way, with its levels also varying in every form of socioeconomic development. The discourse around *Literacy and levels of Literacy*, as well as the discourse around any deficiency towards a Literacy level and its relation to socioeconomic development, depends upon the institutional distribution of power.

Often is the case in which members of societies have very limited chances to use their skills as acquired during their school education, though they are able to read and write, at an elementary level. A great part of their everyday life is full of literacy event, in which for example, they have to know how to answer orally in written material and are definitely in a position to recognize these practices of literacy that are related to the dominant communicative practices of the society. The action of citizens is also an issue of society and not only a personal choice. This issue becomes even more important, if we take into consideration that the development, which emphasizes social cohesion, today more than ever, has to confront/deal with the multiplicity of contemporary societies beyond the traditional concept of a national, cultural, linguistic or religious homogeneity.

The emphasis in the communicative practices of the citizen – instead of the emphasis in an *"objective set (independent from a sociocultural context in time and space) of literacy skills"* – who acts planning his/hers personal and social life becomes more obvious due to the withdrawal of the 'frontiers' between labor, free time and personal life, resulting in a multiplication and an emphasis in difference and multiplicity.

Questions ahead

Between the knowledge society and the working society different literacy practices, social institutions, political or economic forms interfere, making use of the citizens' practice of access, choice and construction of information, each time with different priorities. Thus, new products and services demand the adoption of those educational strategies that the working society is linked with a working culture where life long learning is a prerequisite and where the ability to work concerns those citizens that are able and know:

- How to organize their ideas
- How to transform these ideas into concepts
- How to include in these processes their learning or training references, having conquered high levels of technological literacy.

Most important is the ability to relate one's professional activity with his life experience, in other words his subjectivity. The different way each one of us constructs a notion, the way he identifies himself in relation to the social value allocated to his action, constitutes precondition of the construction of concepts, enriching in this way the developmental policy of the working activity (knowledge management).

The educational and training approaches should make notice of:

- The turn from a book's page towards the multimedia screen
- The turn from the text regarded as an organized unity towards the text regarded as a series of sources for future texts and information management
- The turn from the reproduction of strict textual patterns (narration, description, technical instruction) towards the flexible use of hypertext that brings forward totally different ways of organizing concepts
- The turn from reading and writing texts towards using them
- The turn from the forthright and unique construction towards a multidimensional one
- The management of the polysemy of living languages when they react with technical ones through multimedia design
- The turn from the strictly predefined and single learning strategy towards the strategies that are the result of the unique use of ICT
- The turn from learning towards **meta**learning (knowledge development, exploitation of informal learning environments)

Furthermore, the educational and training approaches should contribute in the development of critical users of the new technologies, which require:

- Multiple strategies for finding information
- Ways to be selective about what they find
- Multilayered ways of judging credibility

Critical users will also need to find ways of judging the credibility of sources. This may be achieved by posing a series of questions:

- Who is the provider of the information?
- What are the qualifications and position of that provider relative to the topic?
- What sorts of interests may be at work in presenting the material in one light rather than another?
- How is the material organised?
- What assumptions are revealed by the categories used?
- What categories are not included?
- What assumptions do the links reveal?
- What is not here?
- Whose interests are being served by this information and by this presentation of information?

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PEPCAA (PEDAGOGICAL PSYCHOLOGY COMPUTER-ASSISTED ASSESSMENT SYSTEM TO SUPPORT INITIAL AND LIFE LONG TEACHER TRAINING): A SOCRATES MINERVA PROJECT PROMOTING NEXT GENERATION COMPUTER-ASSISTED ASSESSMENT

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Abstract

It is generally agreed that improvements in initial and continuing teacher education are essential in order to achieve higher levels of pupil attainment, which are needed in the knowledge economies of the 21st century. Too often, however, educational psychology is either being neglected, or it is being taught as an academic subject, disconnected from its practical application in the classroom.

It is necessary to qualify teacher students and in-service teachers in a way that enables them to develop an effective, motivating, and reflective self-managed learning process with special emphasis on constructive and individualised feedback. Things that can be achieved in a perfect face-to-face teaching/coaching situation by means of immediate, competent, and constructive personal feedback, have to be modelled as identical in function in an e-learning environment, by means of a virtual dialogue between learner and real-time computer-assisted assessment (i.e. assessment that is permanently available and reacts immediately to learner performance).

PePCAA (Pedagogical Psychology Computer-Assisted Assessment System to support Initial and Life long Teacher Training) was a SOCRATES (MINERVA) project supported by the *European Commission*. It focused on key qualifications in educational psychology. Based on long-term leading-edge work of its European consortium members in the fields of innovative models for eLearning, LLL strategies, learner-centred competence development, and different aspects of metacognition, the MINERVA project PePCAA was successful in developing first prototypes of a reflective 'next generation CAA', assessing competences of adequate behaviour by means of the concept of so-called 'micro-scenarios', based on the reflective use of scientific knowledge and methods.

After mapping an European core curriculum on educational psychology, mental learning processes (PePCAA Learning Assessment Circle [PLAC]) were identified in order to construct suitable assessment steps and questions. Based on this background, it is possible to give feedback to the user that reflects which contents it would be useful to deepen, and how – using a metacognitive perspective via the implementation of confidence measures - the individual learning process could be improved.

PePCAA aims to bridge the gap between theory and practice through the use of scenarios that illustrate the link between theory and teaching practice. To facilitate the transfer of learning content to its classroom application, scenario-orientated computer-assisted assessments have been developed and successfully tested in five European countries (UK, ES, BE, DE, SE).

Background and relevance concerning the conference themes

Substantial improvement in teacher training is commonly agreed to be the prerequisite for the profound and sustainable innovation that society needs for our schools and the educational system.

To support and speed up the ongoing shift from a teacher-centred unilateral delivery of information to a learner-centred process of individualised acquisition of knowledge and competences (supported,

consulted, guided, and coached by the teacher in a new understanding of his or her role), initial and also continuous teacher training have to shift their priorities from subject-led presentation of the practitioner's experience-based rules to competences, the ability to analyse and assess new situations and demands, and to develop adequate, scientifically well-based intervention strategies.

Any real learner-centred approach to innovate educational methods and systems has to include substantial progress in learner feedback on existing knowledge, competences, and the status of the actual learning progress and potentials. Therefore it is necessary to use a software tool to present formative scenarios and questions to the learner, to record answers for analysis, and to provide feedback. Things that can be achieved in a perfect face-to-face teaching/coaching situation by means of immediate, competent, and constructive personal feedback, have to be modelled as identical in function in an e-learning environment, by means of a virtual dialogue between learner and real-time computer-assisted assessment (i.e. assessment that is permanently available and reacts immediately to learner performance).

In order to support individual learning paths, improved diagnostic tools for monitoring and guiding the process of acquiring competence are needed:

‘First generation CAA’ (characterised by multiple choice and right/wrong identification) was limited to assessing the successful storage of information presented before in a defined, ‘learning objectives-centred’ process. The broadly observed flattening of learning outcomes triggered by this assessment method was seen as the inevitable price for immediate feedback and substantially lowered costs. ‘Second generation CAA’ – enabled by an interaction between more constructivist concepts on learning and more powerful hardware and software solutions substantially broadened the span of tools to matching, ordering, elements of logical and linguistic analysis, graphical and spatial reactions, tracing of motor responses, etc. The complexity of response behaviour and of the underlying processes of reasoning, planning, and comparing grew substantially. But that generation of CAA is still limited to terminology and to knowledge related to a specific learning process and the curriculum and methods it is based upon.

Today, we need means to better address the purpose of learning beyond the immediate learning outcomes: the competences (in a rather broad and psychological sense of the term) required for work, social cooperation, citizenship, and personal development and satisfaction.

Based on the many years of leading-edge work of the members of its European consortium (FIM NeuesLernen, Universität Erlangen-Nürnberg, Germany; Support Lab for Telematic Learning, University of Liège, Belgium; Open University of Catalunya, Spain; Faculty of Education, Gothenburg University, Sweden; University of Cambridge Local Examinations Syndicate and the Faculty of Education at the University of Cambridge, United Kingdom) in the fields of innovative models for e-Learning, LLL strategies, learner-centred competence development, different aspects of metacognition, the MINERVA project PePCAA 2002-2004 was successful in developing first prototypes of a reflective ‘next generation CAA’, assessing competences or adequate behaviour by means of the concept of so-called 'micro-scenarios', based on a reflective use of scientific knowledge, methods, and metacognitive strategies.

PePCAA – project description

PePCAA (Pedagogical Psychology Computer-Assisted Assessment System to support Initial and Life long Teacher Training) was a SOCRATES (MINERVA 2002 – 2004) project supported by the *European Commission.* It deals with key qualifications in educational psychology (further project information is available on the PePCAA website at http://www.pepcaa.odl.org/).

Using Computer-Assisted Assessments, PePCAA is intended to be a self-learning tool to support teachers and student teachers with actualising their learning potentials concerning pedagogical psychology, to initiate a learning process by using PePCAA assessments, and to demonstrate the relevance and impact of scientific results in this field for daily school life.

In order to bridge the gap between theory and practice, a scenario-orientated case description introduces each assessment, and the subsequent questions illustrate the link between theory and teaching practice. This scenario-oriented approach facilitates the transfer of learning content to classroom application. The use of computer-delivered assessments provides flexible, motivating material, which can be used in a variety of ways. The assessments are intended to stimulate interest in the psychology of education and to help to:

- develop knowledge and understanding of the psychology
- apply the psychology to realistic classroom situations and to the role as a teacher
- increase awareness of one's own knowledge and thinking processes (metacognition)
- reflect on the ability to apply knowledge.

Assessment development steps

European Core Pedagogical Competences

The European consortium started to compile a 'common' European curriculum map on educational psychology by gathering existing curricula and official documents (from departments of education, governments or regional entities) from the partners' countries. This pool of items formed the basis for a specification of metadata to be entered into the question database. Then 400 keywords were presented, defined, and linked to 40 concepts, grouped into 4 issues (Objectives, Methods, Assessment, Processes – OMAP), generating three levels of metadata (keywords/concepts/issues). Based on these key concepts, scenario-oriented assessments were constructed.

PePCAA Learning Assessment Circle

To foster a competence and behaviour oriented learning process, independent from the way of learning (i.e. providing equal opportunities for outcomes of formal, non-formal, and informal processes), and to provoke as well as to assess a reflective, critical use of knowledge and competences, mental learning processes (see figure 1 next page) have been identified in order to construct assessment steps and questions according to these processes. One assessment usually requires several of these mental processes but is unlikely to require all of them. Based on this learning and competence process, phase separation feedback can reflect back to the user which contents would be useful to deepen and how – by using a metacognitive perspective – the individual learning process can be improved.

Metacognition in CAA: Confidence Degrees

Metacognition is knowledge or awareness about one's own knowledge (e.g. Flavell, 1979). Driscoll (1994) wrote that “metacognition refers to one’s awareness of thinking and the self-regulatory behaviour that accompanies this awareness” (p. 104). In other words, metacognition is awareness of one's own knowledge *and* being able to evaluate that knowledge. Metacognition is important because being able to distinguish between knowledge that you are more and less confident about allows you to use your knowledge effectively (Hunt, 1993, Leclercq, 1983). Metacognition is thought to have benefits in learning contexts since awareness and reflection on current abilities and areas of weakness are likely to improve study decisions and to hence have a positive impact. As the PePCAA project aimed to develop a formative assessment tool, developing users' metacognitive awareness could help to fulfil this aim. The combination of a question, its answer, and the question of how confident (confidence degrees in percent) the learner is with his or her answer (sometimes combined with a possibility to justify the answer) allows them to draw conclusions on where during the learning process difficulties have appeared and to raise the awareness of these learning potentials.

Various researchers have developed methods to measure metacognition (e.g. Gardner-Medwin and Gahan, 2003; Leclercq, 1983; Leclercq, 1993). Dieudonné Leclercq brought his experience in this area into the PePCAA project and Fred Neumann developed a Java add-on to the Perception software to allow confidence ratings to be added to questions where required, and also to provide a feedback report on the student's confidence indices at the end of the assessment.

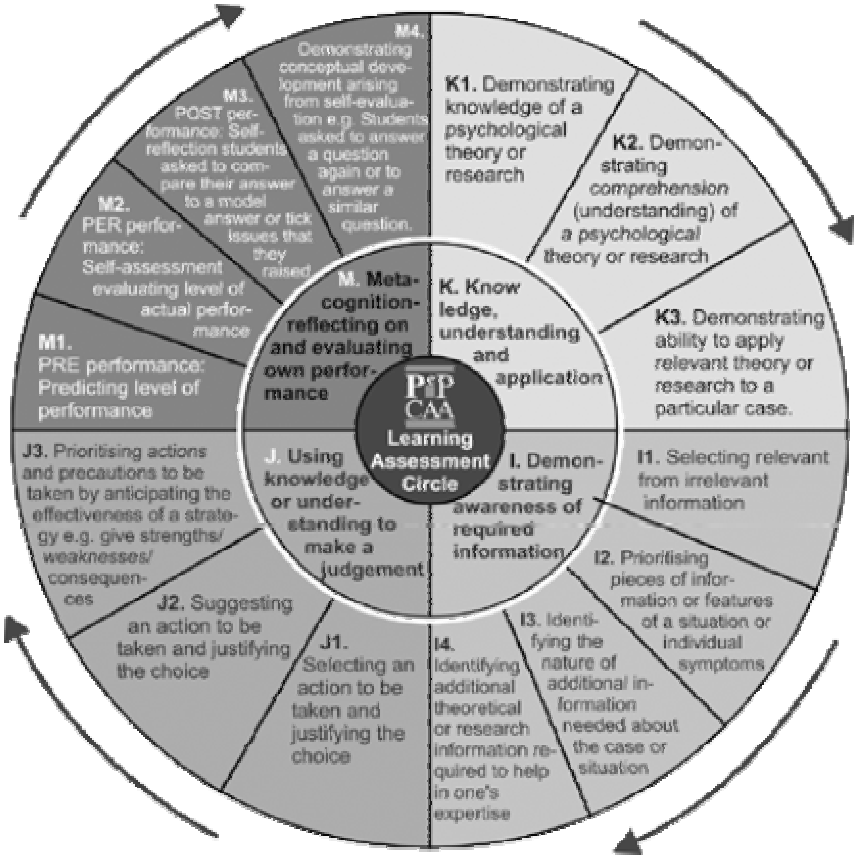

Figure 1. PePCAA Learning Assessment Circle

Assessment evaluation

One of the basic conditions for an effective evaluation is that it leads us to a point where decisions for improvement can be made. For this reason, the assessment evaluation was carried out in two steps: a first, consortium-internal evaluation, and a second, trialling, with real learners in the respective countries.

Consortium-internal evaluation

In order to identify key characteristics of quality, we defined which advantages and disadvantages of such a product should be, and what is considered to be good with respect to each indicator and type of situation in which the indicator must be considered. The identified list of quality indicators was grouped into five blocks, which allowed us to progressively structure the information: scenario as a whole (pedagogical considerations, operational considerations), scenario description, individual questions, scoring and feedback, and transnational suitability. In order to obtain this information, every partner reviewed the assessments of the other partners according to the previously defined quality indicators.

Evaluation in a test bed of student teachers and in-service teachers

With the objective to obtain useful hints and estimations concerning desirable improvements and the general usefulness of our product, a feedback form was implemented after each assessment. It was divided into three parts: questions about the learner, questions about the assessments (see table 1), open questions. Users in all partner countries worked through the assessments and reviewed them using the feedback form.

The outcome of the trialling was, in general, very positive in all countries in terms of the methodology and specific scenarios. Participants reported that the cases were easy to understand, representing a real-life situation, relevant for teachers, well structured, stimulating and helpful. Some participants were not familiar with this kind of tool; however, they appreciated it as a very useful one.

Table 1 presents some statistical results per partner institution:

Table 1	Average	Germany		Sweden		UK 1		UK 2		Spain	
		N	*Mean*	*N*	*Mean*	*N*	*Mean*	*N*	*Mean*	*N*	*Mean*
Knowledge of pedagogical psychology is very important to me	**1.19**	48	1.4	6	1.1	6	0.64	7	0.46	6	1
My current knowledge of pedagogical psychology is very good	**-0.09**	48	-0.13	6	-0.1	6	-0.39	7	-0.46	6	1
The assessment is easy to understand	**0.46**	15	0.4	6	0	6	0.88	7	0.04	6	1.2
The assessment is about a concrete real world situation	**1.16**	46	1.3	6	0.9	6	1.22	7	0.54	6	1
The assessment is about a relevant situation for teachers	**1.15**	46	1.28	6	0.9	6	1.36	7	0.54	6	0.9
The assessment is well structured	**0.71**	43	0.72	6	0.2	6	0.88	7	0.14	6	1.7
The assessment is too long	**-0.26**	46	-0.67	6	0.2	6	-0.33	7	-0.43	6	2
The assessment is stimulating	**0.84**	46	0.9	6	0.7	6	0.87	7	-0.04	6	1.5
Working on this assessment was helpful	**0.58**	46	0.43	6	0.9	6	0.95	7	0.04	6	1.6
The feedback given was helpful	**0.78**	46	0.78	6	0.5	6	0.97	7	-0.21	6	2

Values are sum of: +2 for strongly agree, +1 for agree, 0 for neither agree or disagree, -1 for disagree, -2 for strongly disagree

These results are encouraging, since all values for desirable statements (e.g. 'the assessment is stimulating') were positive and almost all values for the undesirable statement (i.e. 'the assessment is too long') were negative. The responses also tell us that most students thought psychology relating to teaching was important, but that they were not confident of their knowledge in this area.

Students seemed to like the concept of such a formative scenario-based assessment tool focussed on psychology relevant to teaching. However, a number of general issues were raised about the tool as well as more specific issues about the individual scenario-assessments. Changes were made to the individual assessment scenarios in the light of the above findings and the responses to the open questions in the questionnaire.

With regard to the types of questions available, some students liked having open-response questions even though they were not automatically marked, because they felt this made them really think about the question and formulate their own viewpoint. However, others felt it was not worth their time composing an answer if it was not going to be marked. Some students liked the multiple response questions which sometimes made them think about advantages, disadvantages or outcomes of a teaching strategy that they would not have thought of on their own. Other students were sometimes critical of the way that marks were assigned to such questions, arguing, with some validity, that there is not one definitive answer to such questions because the topic is somewhat subjective. In addition, some argued that the options provided in the multiple response questions did not provide the answer that they wanted to give. This is one advantage of using some open answer questions. With such mixed opinions and various advantages and disadvantages of the different question types, it is probably sensible to use a mixture of question types.

Some students reported that they would have liked to know how many questions an assessment was going to contain from the start. In some scenario assessments, in which we felt this might be a problem, a sentence was added at the beginning of the scenario during post-trialling revisions stating how many questions there would be in total and into how many sections these would be separated.

Some students (especially in Germany) reported that they sometimes found the psychological language that was used difficult. Since the aim was to improve their knowledge on relevant

psychology, which would involve becoming familiar with such terminology, few post trialling changes were made with regard to the language used. Nevertheless, the students' comments highlighted the need to use technical language with care when preparing such assessments.

In order to make the assessments more formative in nature, and to respond to a few criticisms that not enough feedback was provided for some questions, more links to useful websites explaining relevant psychological topics were added to the assessments after the trialling. This will allow students to follow up on areas of interest or topics that they realise they do not currently know enough about.

The initial assumption of the project was that it would be possible to share scenario assessments between the partners from different countries, subject to translation and with only minor adaptations for language and detail. Experience from assessment development and trialling showed that transferability was in fact much lower than expected. Differences in the structure of school systems, differences in teaching approaches and priorities in teacher curricula lead to more extensive cultural localisation work of the assessments. For example in Sweden, educational psychology is not generally included as a subject in the curricula of teacher education programmes; however, other countries (e.g. Germany) have a much more theoretical approach to teaching the psychology of education.

Future perspectives

PePCAA made first steps to an innovative use of CAA to promote metacognitive scientific reflective eLearning and to integrate formal, non-formal and informal learning outcomes into performance-orientated competences. However, many other questions certainly still remain to be answered and also new technical solutions are required to accomplish next generations needs.

The project focus was limited to the field of educational psychology as an important element in the initial and continuing training of teachers. This work needs to be continued and expanded, including a broader conceptualisation, development, and pilot testing of the methodology in different European 'educational cultures' and languages. The potential could be explored in order to identify European commonalities in teachers' needs and teacher motivation and, at the same time, find out how to combine micro-scenarios on commonalities with scenarios and scenario-elements tailored for a specific culture, country, region, type of school, teacher subject, etc.

On the basis of PePCAA, new projects can aim at taking a substantial step forward towards developing a piloting tool that is sufficiently broad, mature, and important to open the door towards mainstreaming its development, and the integration of 'next generation CAA' into innovative eLearning in general.

Conclusions

In a period of constantly growing awareness on the importance of lifelong learning, in which informal learning is seen as a way to develop competences similarly important as formal and non-formal processes, in which the aims of education shift from reacting correctly towards behaving proactively and responsibly, reflecting also on goals, values and effects, learning assessment has to cope with those challenges in a provable way. It needs to be competence- and behaviour-oriented, independent from the way of learning (i.e. providing equal opportunities for the outcomes of formal, non-formal, and informal processes), provoking and assessing a reflective, critical use of knowledge and competences, accepting that a learning outcome as the process of learning itself is constantly changing as a dynamic portfolio, combing a reward for successfully mastered elements with the challenge and joy of new opportunities to set future goals.

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THE DIFFICULT ART OF VIRTUAL WORK – ABOUT INTRODUCING ON-LINE GROUP WORK FOR STUDENT TEACHERS

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Abstract

Several recent surveys indicate that student teachers are poorly equipped when it comes to the use of information and communication technologies (ICT) in general and the pedagogical use of ICT in particular. The two-year research project within the Stockholm Institute of Education has investigated how students in the teacher education programme develop their professionalism, and how the use of ICT in the educational setting can have bearing to this development. This paper analyses the ways the students have been working in small groups. Our findings indicate that the oral tradition in teacher education is strong and that more rigorous and systematic methods should be applied in order to establish and evolve learning practices that make use of ICT in the way that is relevant in the new Knowledge Society.

Introduction

We all agree by now that the role of teachers is central in the new Knowledge Society and that the role they have is changing as new competences and skills are required.

When it comes to ICT, public schools in Sweden have long been object to governmental attention and encouraged to participate in the ICT development. Numerous are the projects that have been initiated with state funding[1]. Swedish teacher education, however, has been neglected in this respect. This is confirmed by several recent survey reports[2] that indicate that Swedish student teachers are dissatisfied with the ICT training they are provided at the teacher education programmes and that they are poorly equipped when it comes to the pedagogical use of ICT. Only this year major financial support is directed to teacher education. This funding will cover development projects only at a few institutions. In the meantime, the majority of teacher education is forced to find ways of introducing ICT within the existing organisational and financial frameworks. One of the tactics applied by Stockholm Institute of Education has been to introduce a computer conferencing system (LearnLoop) and make it available to all courses at the institute. The use of the system is not obligatory and no general directives have been introduced to the whole institute. This means that there exists a huge variation in use. As ICT still is a new, emerging practice both among the teachers at the institute and the teachers-to-be, it is important for the development of the teacher education to investigate how this practice is evolving. We know from the literature of computer-mediated-communication and of distance education that it is always a major challenge to build a functioning 'learning community'. This is why we need to encourage and support the development of the practice of communication through ICT, and we hope that our project will shed more light on the prevailing premises for the use of ICT in pedagogical contexts.

[1] See the several projects funded by the Swedish Knowledge Foundation. Http://www.kks.se.

[2] See for example 'Lärarstuderande och IT 2004'. A report from the Knowledge Foundation: http://www.kks.se/upload/publikationsfiler/lararstuderande_och_it_2004_2004_publ.pdf,
'IT I lärarutbildningen – attityder, användande och kunnande bland lärarutbildare och studenter 2004'. A report from the Knowledge Foundation: http://www.kks.se/upload/publikationsfiler/it_i_lararutbildningen_2004_publ.pdf

Our Study

The goal of our interdisciplinary two-year research project has been to investigate how students enrolled at the teacher education programme at the Stockholm Institute of Education have developed their professional thinking during their education and how the use of ICT has supported their learning experience. The focus of the study was how individuals and small groups (5 to 7 members) experienced ICT and how they used it during a course. The main issue that we have observed was the facilitation of dialogue, and how to create possibilities for new encounters to take place.

We followed students at three parallel classes, each with their own teacher during two years time. During the first phase of the study, 21 students were interviewed about their understandings and ideas of the roles of a teacher and how they used ICT in their studies and what they thought of the use. Virtual interactions of six groups have been observed. For the second interview, 11 students from the original 21 were engaged and the questions from the first round of interviews were repeated.

The Context of the Study - The course – 'Cultural encounters and cultural analysis'

The course named 'Cultural encounters and cultural analysis' has been[3] part of the so-called general field of 60 credits which is obligatory to all students in the teacher education programme[4]. It is interdisciplinary and connected to the activities in schools where the students do their teaching practice. It gives a total of 10 credits and was parted, at the time of our study, in 2-credit sections running during five terms. Each section had its own theme.[5] The main goal of the course has been to give students an opportunity to develop their ability to understand different life situations and conditions, to investigate, analyze and understand different cultures and cultural representations.

Students met face-to-face with their teachers only four times per term. During the rest of the time, communication took place in the conferencing system or through e-mail and telephone. A few lectures were given to the students but most of the work in form of observations and interviews was supposed to be carried out at schools where the students were doing their practice. Another important part of the course was the reading and discussion of fiction. Students worked in small groups and presented their work both orally and textually as individuals and as groups. Examination at the end of each section was individual and consisted of a short paper.

LearnLoop – the conferencing system

The course design in the conferencing system followed the well-established model of dividing the space in public and private. Public area was accessible to all the course members. Each small group had a private working area for their own use. In the public space, the teacher of the course provided information of the course and documents that had relevance to the course. It was also possible to exchange messages in the public area.

No general introduction to the use of the conferencing system was arranged but each teacher took care of the introduction in the way they found suitable.

[3] At present, this course takes place during the first term of the teacher education programme.

[4] The Swedish teacher education programme comprises of three integrated educational fields:
a general field with common courses for all students, *an area/s of emphasis* which forms the basis for the teaching degree, *an area/s of specialisation* which provides a broader and/or deeper perspective in a specific subject/theme. The programme is concluded with an individual project work.

[5] School areas and their cultures, Cultures of children and youth in and outside school, Cultural clashes and cultural encounters, Pedagogical cultures and subject cultures, Teacher as a culture bearer.

Student attitudes towards ICT

When students in the teacher education programme were asked about their use of ICT it struck us how conservative they were in their statements.

A student described herself as *"an experienced surfer"* who actively sought for information on the Internet. However, when we asked her about the use of the conferencing system the same student said that she logged in occasionally *"to have a look"*. She was generally positive to the use of the conferencing system but said that students were inexperienced in using the system and did not know how to go about. There was a tradition to get together for face-to-face meetings for discussions and this applied to most of the courses, concluded the same student.

Another student described himself as *"a moderate ICT-user*". He used e-mail and sought for information on the web. The conferencing system did not have any pedagogical value for him and he was quick to talk about the problems connected with the Internet use. This can also be illustrated by an utterance a student made in an ongoing LearnLoop dialogue about the outline of a field study: "*My suggestion – maybe somewhat late – is that we meet face to face. For me, it feels a bit difficult to conduct a direct discussion here. Or?*" A female student admitted that she "*has a lot to learn when it comes to ICT"*. She paid her bills on the Internet, used e-mail and word processing programme. She said that *"you can do a lot more, like Power Point presentations and seek information on the Internet"*. She had also created her own portfolio where she collected her assignments and papers. She found the portfolio useful for organising things.

These examples show that students were familiar with e-mail and word processing and some of them even used the Internet for information seeking and for other services. But the conferencing system seemed to be unfamiliar to most of them. A few mentioned that they had used the conferencing system in other courses but that the use had not been systematic. It became evident from the interview data that the attitudes of the students towards ICT were temperate. They did not see ICT as a central pedagogical tool. They also pointed out that the teachers at schools where they were doing their practice did not use ICT, and, consequently, there did not seem to be any greater need for using ICT. These students seemed to be less positive to ICT than those in the national study where 62% of the respondents thought that ICT would be a useful or a very useful pedagogical tool for them in their future work as teachers.[6]

Teacher attitudes towards ICT

Teachers at the Institute who were teaching the 'Cultural encounters' course, were neither familiar with the conferencing system nor knew how they could use it as an educational tool. Some teachers felt that they 'had been forced' into this system and subsequently their use of it was limited to providing course information and perhaps also distributing assignments through the system. They saw the system mainly as a nuisance, an extra burden in their already heavy work load. However, a group of teachers decided to *'give it a try'* and were ready to discuss new possibilities and to start experimenting more in order to activate the students and encourage them to dialogue. They felt, however, that they would have needed much more training in technology use than had been provided by the Institute.

Students' on-line work during the course

We researchers who were observing the course did not wish to interfere too much but to see how things were evolving 'in the natural setting'. In the beginning of the course, there was not much to observe, to our disappointment, which made us to apply a more action-oriented approach. We had a meeting with the three teachers of the course in order to discuss their experiences of the course and its

[6] 'Lärarstuderande och IT 2004'. A report from the Knowledge Foundation: http://www.kks.se/upload/publikationsfiler/lararstuderande_och_it_2004_2004_publ.pdf

goals. During the discussions, partly encouraged by our suggestions, the teachers decided on a common strategy: they would introduce an obligatory on-line assignment. In this way they hoped to increase the on-line activity of the students.

In the beginning of the course, we had observed that the students tended to use the conferencing system – in case they use it – for short communications about **organising** their work, not so much about their work. We saw very little of real discussion concerning the content of the studies. Besides, students seemed to prefer e-mail to the conferencing system. We understood that e-mailing and sms-ing were part of their everyday activities, which was not the case with the conferencing system when they started studying at the Institute. Even the teachers seemed to prefer e-mailing to the conferencing system. They found the log-in-procedure of the conferencing system complicated.

In the following we will present our analysis of the students' on-line work. We will describe the work from two aspects: temporal and content wise. The figure nr 1 summarizes activities of one group during a time period from November -02 to June -04. Activities have been divided into three categories: administrative activities, social activities and course content related activities. The figure illustrates clearly that administrative activities dominate which means that LearnLoop was used for organising group work, establishing schedules and working orders. Course content related activities are much rarer. We can note that these consist only of the obligatory assignments, i.e. comments on literature and films that each student was obliged to make.

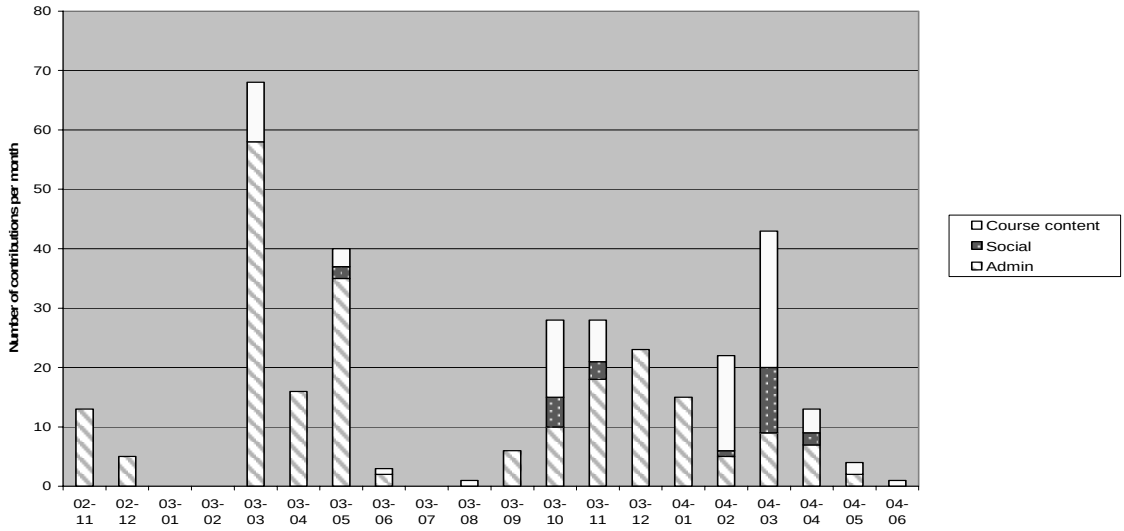

Figure 1. Communication in LearnLoop, Group 1

People's conceptions of a technology rule the ways they are able to use it. In the interviews of the students it became very clear that they had very vague understandings of how actually the conferencing system could be used in a pedagogical context.

A student showed that she understood the dynamics of the conferencing system when she said that *"Members of the group should use the possibilities offered by the system. This requires, however, that each and everyone logs in regularly."* She pointed out a problem that many of the students seemed to have noticed but she did not give any solutions for what seemed to be a disciplinary problem, or rather an engagement problem. How can we make everyone log in regularly? Is this something students should know like they know that they have to attend lectures? How can virtual attendance be promoted? Teachers of the course tried to solve this problem by introducing an obligatory assignment on-line. Each student was to write about a book they all had read. We could, however, note that engagement could not be created through force. In LearnLoop transcripts we could read: *"Let's have this discussion now that we are supposed to have in order to get it over with*!" What could have evolved into an interesting exchange of ideas and thoughts was diminished into a dull obligation.

Students also seemed to have understandings that there are things that cannot be done on the Internet. As an example they gave the presentation of their group work. Preparations for the presentation require physical meetings where *"things can be practiced"*, they claimed. It is interesting to note that presentations were understood as representations of orality, oral accounts of the outcomes of the group work, even dramatization, but never purely audio-visual.

One student found computer conferencing *"difficult, slow and unstructured"*. No wonder that he just logged in *"the night before our group meeting to check out if something had appeared"*.

Students found the conferencing system as a difficult instrument for discussion. Textuality did not seem to appeal to them. One student said:*" Teachers talk* (emphasis by the author) *all the time. They interact with people. I prefer oral encounters and oral examinations. Writing is laborious."*

Emerging working strategies

Even though the activities of the groups that we have been studying have been scarce we have been able to distinguish a couple of evolving repertoires of working practice.

One of the groups showed what we could call 'an instrumental strategy' in their group work. During a face-to-face meeting, this group discussed "*intensively*" and agreed upon the distribution of labour within the group. Each and everyone were expected to bring in his/her contribution and in a certain pre-defined order. After the minutious turn-taking, the parts were compiled into a final project paper.

A group member said: *"there is no personal* (emphasis by the author) *contact during the writing process as everything takes place on-line. There* (in the conferencing system) *the messages are short and not particularly developing. The focus is on the paper and getting it finished."*

These students were product-oriented in their group work. They did not see the group as a possibility to process their experiences. The focus was on the outcome, the paper that had to be produced. The students did not see the process of working in the group and producing a paper together as something valuable or the group as a possible arena to develop their professionalism. Instead, they narrowed down the communication into a technical level: it was about dates and working orders instead of becoming an engaging interaction, a dialogue, about the profession.

We could find in our data that only one of the groups developed a more systematic way of using the conferencing system during the course. As a complement to their regular face-to-face meetings the group decided to meet in synchronous chats. This they did for time saving reasons, not that they found chat as a good meeting forum. Members of the group lived quite dispersed and the conferencing system provided a way to 'get together' more easily.

One of the group members was telling:

"We all log in a certain time and then we just sit there and discuss and reflect upon literature or films that make part of the course content. Last time we talked about an assignment. Each one of us was to interview a teacher at the school (where we do our practice) and so we decided to get together in a chat and discuss what kind of questions we should have in the interview. So we agreed upon the questions and a month later, after having completed the interviews, we got together again and discussed the answers that we had received in the interviews."

So for this group the work consisted of two phases. First, they had to come to an agreement about the interview questions. In this negotiation phase, they learned to understand others' points of view and to compromise. In the second phase, after the interviews, they learned about different outcomes to the same questions. They compared and got insight of the various conditions at different schools which was one of the aims of the course.

As we looked more closely at this group that managed to develop more elaborate working practices, we discovered that this group was more sociable than the other groups (Figure 2). They had frequent face-to-face meetings and they often had lunch/dinner together. This group worked a lot on developing a sense of trust within the group. They were open about themselves, their interests, worries, and concerns. They showed commitment to the members of the group. Communication in this group showed examples of 'positive enforcement', i.e. the members of the group made frequent positive comments like *"Our presentation was really good!", "We made such good work together!"*. This kind of comments undoubtedly contributed to the 'group spirit'. In addition, we can note that the members of this particular group were exceptionally organised as individuals and subsequently as a group. They were motivated, high achievers who ambitiously solved their common assignments.

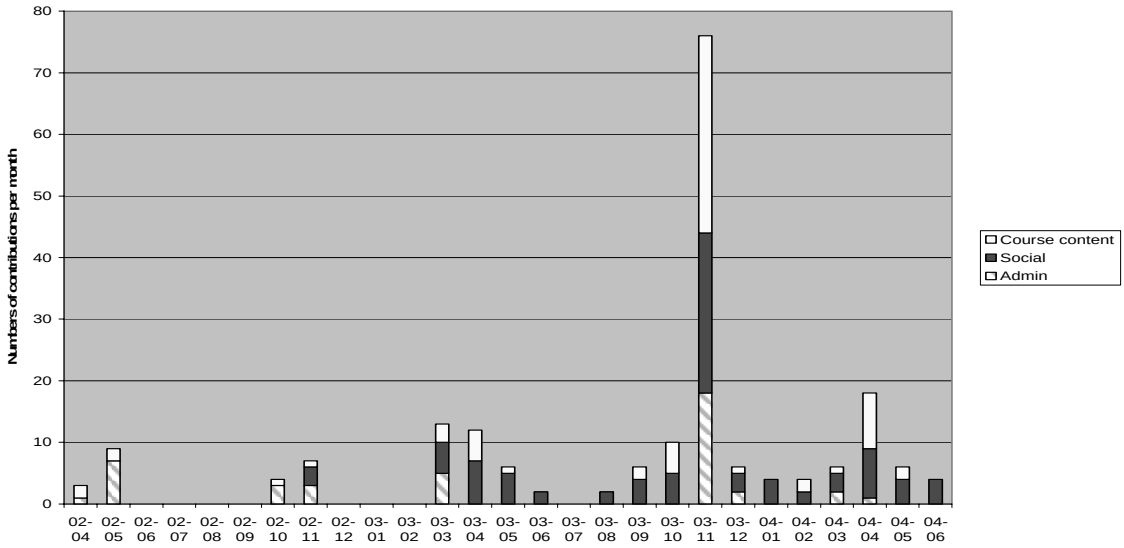

Figure 2. Communication in LearnLoop, Group 2

It is interesting to note that the technical problems that occurred did not manage to discourage this group. Despite of the fact, that some of the members were cut out of the chat every now and then, because of the instability in the system, they kept on logging in and continuing the discussion. This shows how motivated and determined they were. In other groups, the same technical difficulties had a paralysing effect: no discussions took place.

Final remarks

Teacher education has a strong tradition of physical encounters; meetings, seminars and lectures. This is not easy to change, and it can be questioned if it should be changed. However, the students are now more mobile than before, as they are sharing their time between the Institute and their partner area/school where they do their teaching practice. The conferencing system was introduced as a common virtual space in order to make communication easier. But as we have noticed, even if the technological infrastructure now exists, the use of the conferencing system is still fragmentary.

We have noted that successful group work on-line requires development of a 'learning community'. As Wenger (1998)[7] has described, there are three necessary dimensions for a learning community to evolve: **mutual engagement**: in which members of the group develop expectations about how to interact, how to treat each other and how to work together; **accountability to the enterprise**: members of the group develop a shared understanding of the enterprise, its culture and how to participate in its values and activities**; a process of negotiating a repertoire**: through constant membership of the community members begin to understand its practices, interpret them and develop

[7] Wenger, E. (1998) Communities of Practice: learning, meaning and identity. Cambridge, Cambridge University Press.

a repertoire of practice that is recognisable to members of the community. These dimensions we found only in one of the studied groups where the members of the group were exceptionally dedicated to their studies. In more 'average' groups the role of the teacher becomes central as a facilitator and guide.

If a group is to evolve into a learning community, a lot of effort and engagement is required of the members. It may be difficult to create favourable conditions for such engagement to evolve during one single course, particularly when it is dispersed in time like the one we have been observing. Anyhow, it seems clear that a lot more systematic strategies need to be developed by the teachers in order to engage students in learning communities. It seems that teachers are not fully aware of their central role. Besides, our experience is that what works best should not be a question of either or, but rather of coming to terms with both textuality and orality, and support students to become familiar with mastering both virtual and face-to-face learning environments.

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NEW ROLES OF A TEACHER IN E-LEARNING SYSTEMS

Jolanta Chec, National Institute of Telecommunications, Poland

1. Introduction

Very quick development of new information and communication technologies (ICT) enables evolution of the society towards Global Knowledge Society based on knowledge and information as key resources to be used by anyone, anytime, anywhere. Human knowledge should be currently updated in such society so education plays a very important role in Knowledge Society in which learning should be a continuous process that lasts through the whole life (LLL; Life Long Learning Process). LLL Process is realized by both educational systems: *initial education* at each level (primary, secondary, higher education) and *continuing education (*in the meaning of knowledge updating such as postgraduate studies, set of courses, workshops). Modern ICT tools caused the birth of new forms of education for LLL Process that are realized by new educational institutions such as Open University, Virtual University and ALN networks.

Learning Process (considering pedagogical aspects) does not change, tools that support it only change. Computer technologies, being used in education, are new elements added to existing tools that support teaching. Computer technologies should be a set of cognitive tools, not only tools for gathering, storage and transfer of information. It can be realized by modern and appropriate e-learning systems. It involves emergence of new roles for teachers and new professions being realized in two phases:

- during preparation of e-learning courses and
- during learning process (interactions between teacher and learners) by the use of e-learning systems.

Kolb's pedagogical theory used by e-learning systems for creation of appropriate learning environments that facilitate the learning process, use of a computer as a creative and cognitive tool for support of knowledge creation in the human brain, my classification of e-learning systems in accordance with new teachers roles, characteristics of new professions and new teachers roles for creation and use of e-learning systems are presented in the paper.

2. Kolb's pedagogical theory for e-learning systems

E-learning systems should ensure creation of high quality learning environments that facilitate learning process. Good understanding of learning process is very important for designing and implementation of appropriate (concerning type of knowledge and learning styles) and useful learning environments. According to Kolb's pedagogical theory: learning is a process whereby knowledge is created through the transformations of experiences. The learning process is not identical for all human beings so different learning styles can be distinguished: accommodation, divergence, assimilation, convergence. Four learning modes: active experimentation, abstract conceptualization, reflective observation, concrete experience and four knowledge types: convergent, assimilative, divergent, accommodative are determined according to Kolb's theory.

An appropriate learning environment (that supports learning mode) is needful for effective learning. Learning environments can be of the following types: behaviourally complex (the emphasis is on the active applications of knowledge and skills to a practical problem), symbolically complex (a learner is involved in trying to solve a problem for which there is a right answer), perceptually complex (the main purpose is to understand: to be able to define problems, to identify relationships between concepts), affectively complex (it emphasizes experiencing what it is like to be a professional in the

field of study). Each subject (academic fields such as physics, mathematics, history, business, engineering, etc.) belongs to one knowledge type. Such classification is useful to design appropriate learning environments. For example: learning an engineering subject (that belongs to convergent knowledge) requires environment that is behaviourally and symbolically complex.

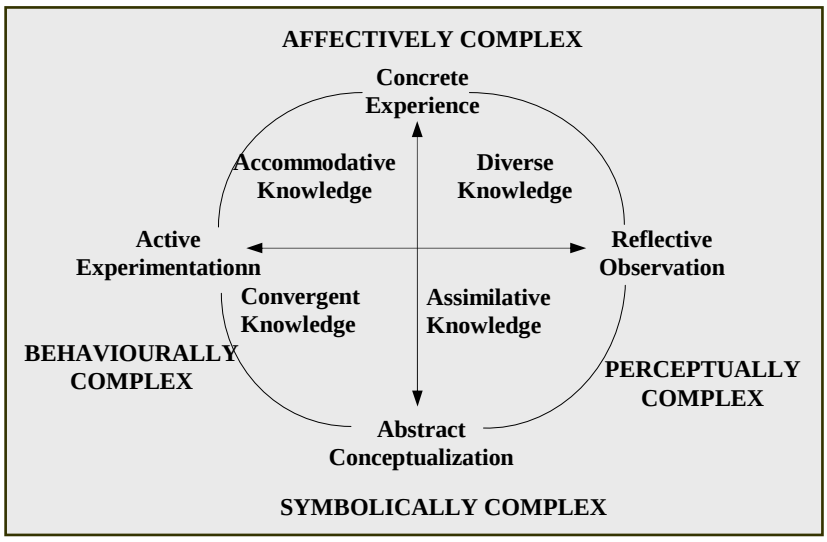

Figure 1. Kolb's pedagogical theory

Each learning environment can be characterized by primary and secondary features. The following primary features are ensured by learning environments:

- *step by step solution to a problem* – is ensured by behaviourally complex learning environment;
- *focus on process* – is ensured by perceptually complex learning environment;
- *small group discussion* – is ensured by affectivelly complex learning environment;
- *symbolic tool* – is ensured by symbolically complex learning environment.

The selection of appropriate environment features depends on the type of knowledge to which a learning object belongs and also learner characteristics (learning styles, goals, preferences, experiences).

3. Computer as a cognitive tool in the teaching process

Computer should be used as a creative and cognitive tool to support learners during learning process ensuring high quality and effective learning. Computer should be used for support of thinking process and facilitation of knowledge building in human brain. Process of information understanding enables creation of mechanism of automatic learning. It is possible to distinguish two kinds of knowledge according to Anderson: declarative knowledge (to know that) and procedural knowledge (to know how). D. H. Jonassen developed model for cognitive tools that is similar to Guilford model of three dimension structure of mind. Jonassen model assumes that cognitive tools are placed in three-dimension space (see figure 2).

Creation of computer educational program that enables use of a computer as an intellectual, creative and cognitive tool requires educational technology knowledge, knowledge of use of cognitive tools, computer technology knowledge. It involves emergence of new professions.

4. Types of e-learning systems according to new teachers roles

Modern e-learning systems change the role of a teacher from a person who gives lectures in a didactical form (traditional teacher) to the tutor who supports learners in their learning process (asynchronous and synchronous interactions between a tutor and learners). It is possible to distinguish two kinds of a teacher in e-learning systems: human teacher and computer teacher. I have made a classification of e-learning systems, in accordance with new teachers roles, presented below (p.4.1-p.4.5).

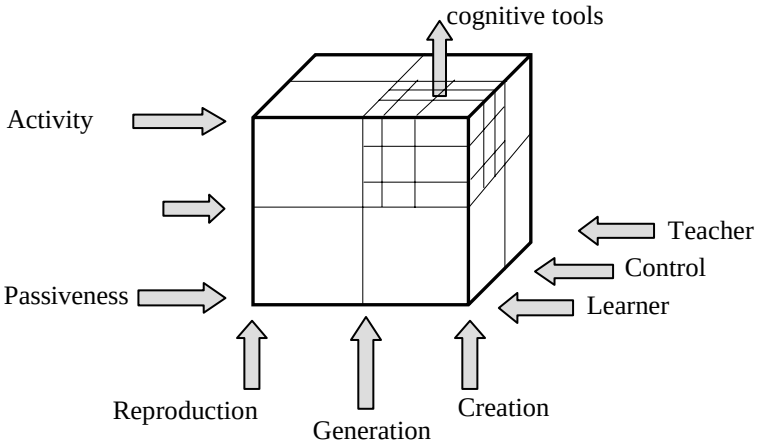

Figure 2. Cognitive tools

Creation of an appropriate e-learning system that supports learners should consider pedagogical theories concerning learning process (Kolb's pedagogical theory, see p.2), creative and cognitive features of a computer (as an extension of a human brain) see p.3, learners needs and their characteristics. Technologies used for creation of modern educational applications can be classified as follows:

- presentation technologies – for presentation of learning material content to the learner;
- distribution technologies – for delivery of the learning material content;
- interaction technologies – for human interaction during learning process.

Telecommunications tools used in a learning systems are of two types:

- synchronous tools – for communication between teacher and learners at the same time;
- asynchronous tools – for communication between teacher and learners independently on time.

Artificial intelligence tools and modern presentation technologies (including adaptive hypermedia ensuring rich presentation of didactic material) enable individualization of learning process (personalization of learning content and learning in self pace) according to learners needs considering their current knowledge, experience, preferences, customs and learning style.

The preparation of teaching contents and their presentations can be done by different persons. Modular courses can be joined for individualized training programs designed according to the requirements and needs of the learners. The e-learning courses should be prepared by a team of specialists (new professions): domain knowledge (in the scope of the course content) expert, specialist of educational technology and specialist of computer and communication technology. It requires to organize an appropriate team for producing courses by selection of appropriate persons, to clearly determine the roles of each team member, to determine ways of communication between team members according to members possibilities. E-learning course production process comprises: essential content preparation by domain knowledge expert, preparation of didactic form of essential content by co-operation between domain knowledge expert and educational technology specialist, electronic production of actual course material with learner support system (communication tools for interaction, tools for evaluation, access to system information, registration and payment functions, etc.) by computer and communication technology specialist.

4.1 Stanford system

Learning process is transparent for a lecturer. Lectures transmitted by television were recorded on video cassettes, digitalized and accessible by the use of Internet (video on demand). Students were allowed to take the lectures asynchronously. Their homeworks and exams were synchronized with those for students on-campus or by broadcast television. To the lecturer, there was no difference between an Internet student and the traditional and television student. Degrees received in an on-line mode are of the same value as degrees received in an on-campus mode.

4.2 E-learning system with human tutor

Human tutor (new profession) supports learners in the learning process by interaction in synchronous and asynchronous modes. Domain knowledge (to learn), learning technology knowledge and knowledge how to use computer and communications tools are indispensable for human tutor to facilitate learning process. Human tutor uses asynchronous and synchronous tools for communication with learners. Synchronous tools are very good for brainstorming and starting of new activities. They enable immediate feedback. Asynchronous tools are very good for self-paced learning, collaboration between learners from different time zones. They enable reflected feedback. In the case of synchronous communication tutors more easily keep the thread of a discussion on track than in the case of asynchronous communication. In the case of asynchronous discussion tutors can answer only once to all (instead of giving answer to each learner) learners and can moderate discussion without the pressure of time (not immediately).

4.3 System using knowbots

Repetitive tasks of human facilitators can be automated by the use of intelligent agents techniques. Knowbots (Knowledge Robots) are intelligent software agents used in online courses that simulate a human relationship, by doing something that another person could otherwise do. Knowbots use intelligent agents techniques. Learners appreciate immediate feedback and the ability to get help rapidly. They want effective immediate feedback (human or machine). Feedback can be provided by intelligent agents in an on demand mode. Knowbots can perform the duties of online facilitator (tutor) for routine tasks. They are placed between the learner and the teacher/facilitator, enabling the interaction. General architecture of the knowbot system comprises the following components: the knowbots, the knowledge base, the repository of assignments, the user/learner and the interface with the facilitator. Knowbots consist of: user-interface agents, checker agents (autonomous agents that check submissions), e-mail agents and knowledge base modules. It is possible to distinguish the following types of knowbots: scheduled, on-demand and submission helper.

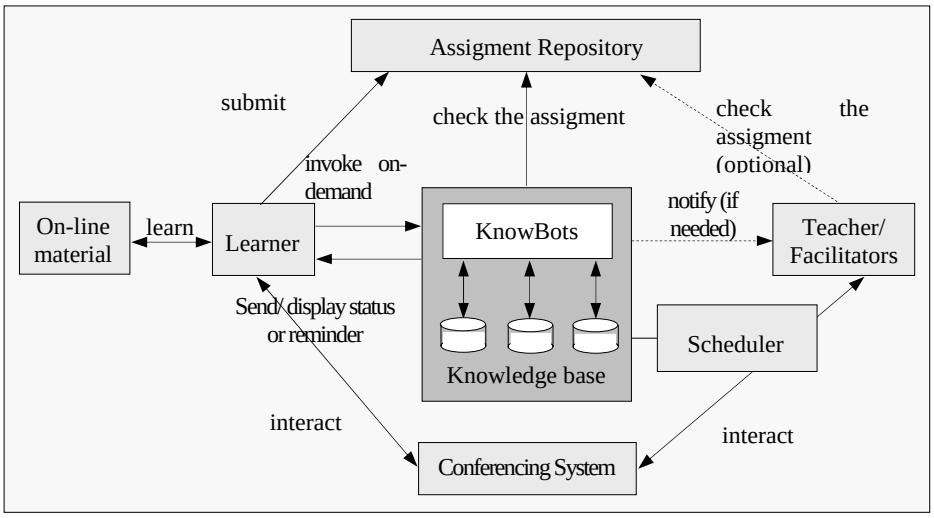

Figure 3. General Architecture of the Knowbot System

4.4 Hybrid system

They are combination of E-learning system with human tutor and System using knowbots. They use knowbots (see p. 4.3) for automation of repetitive tasks, performed by human facilitators, by the use of intelligent agents techniques. Human tutor can communicate with learners by the use of asynchronous and synchronous communication tools (see p. 4.2).

4.5 Intelligent teaching system

An intelligent teaching system (computer teacher), using artificial intelligence means, facilitates the learning process by continuous adaptation to individual learner needs and learner characteristics during learning process. Intelligence of such system is contained in its pedagogical decisions (how and what to teach) and information about learners. Figure 4 shows the concept of such system in accordance with IEEE LTSC standards.

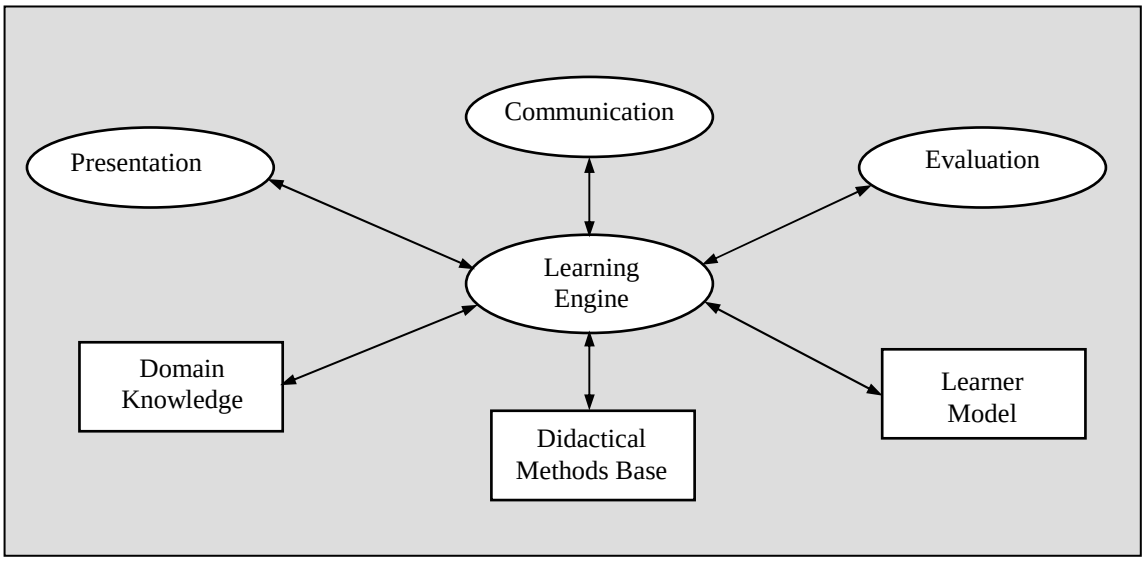

Figure 4. Intelligent Teaching System

The learning engine is used for the steering, control and co-ordination of the components. The Didactical Methods Base contains different didactical methods and concepts, supporting authors and educators. The Learner Model stores information about the individual learner reflecting learner current knowledge state. Learner model is a set of parameters containing the information about learner's personality, experience, education. It is important for each system adaptive to a user. Domain Knowledge contains learning objectives and contents. The Presentation component allows generation and presentation of learning contents in different ways according to learner characteristic on the bases of currently updated learner model. The Evaluation component determines the performance of the learner providing tests. The Communication component determines the level of interactivity of a learning environment.

The intelligent teaching system (as automated tutor) uses information from a learner model in oder to determine pedagogical decisions that meet needs for each learner (especially to control learner's progress and to adapt the course presentation to individual learner). Teacher strategies comprise the methods of instruction and the way of material presentation. In practise a teacher uses more than one teaching method in teaching a subject according to the type of domain knowledge. Teachers also switch from one method to another method for the same material according to student different styles. An effective intelligent teaching system must be able to provide multiple teaching method.

Conclusion

Modern and high quality e-learning systems should consider pedagogical aspects of e-learning process. Kolb's pedagogical theory is very useful for creation of appropriate and high quality e-learning environments (considering learners styles and type of knowledge) that facilitate learning process.

Different and new roles of a teacher can be distinguished depending on the kind of e-learning system: Stanford system, e-learning system with human tutor, system using knowbots, hybrid systems, intelligent teaching systems. It is possible to distinguish two kinds of a teacher in e-learning systems: human teacher (tutor that supports learners in the learning process by the use of asynchronous and synchronous tools) and computer teacher (automated teacher) that is able to teach continuously according to a student learning.

E-learning systems should use computers as creative and cognitive tools that support intellectual processes in human brain facilitating knowledge creation. The development of such a system requires combination of computer knowledge, learning technology knowledge and domain knowledge. It may be realized by a team of appropriate specialist or by new professions.

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EVALUATION STRATEGY IN THE TECHNOLOGY ORIENTED EDUCATIONAL PROJECTS, THE ADDED VALUE FOR TEACHERS „LIFE IN WINTER" PROJECT

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Project Background

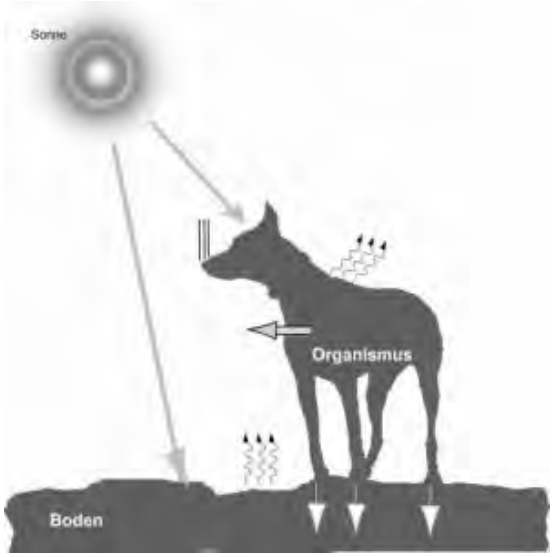
Science teacher pre-service training and enhancement as well needs to consider new frameworks and new teaching practices as well. New perspectives on teaching tend to conflict with the pre-service teachers' previous and dearly held conceptions of teaching. Every pre-service teacher is itself an insider concerning the future profession due the individual school experience. Therefore, any implementation of new teaching strategies tends to face conflict. However, changing teaching practices at any point of a teacher career is a difficult and stressful process due to complex social and intellectual frameworks that both enable and constrain efforts to change. However, the pre-service training as an individual struggle period for an formation of an own professional identity as a particular kind of teacher might provide the most likely time period to achieve the goal. For in-service and pre-service teacher as well, any understanding of natural phenomena within every day life and the environment requires an interdisciplinary methodology. Any didactical reduction of most complex biological systems calls for an integrated application of contents of the different subjects within different disciplines of science at least. Modern approaches, therefore, try to overcome the century-long division in the three separate subjects Biology, Chemistry and Physics without falling back into the natural history tradition of the 19th century. This subdivision of Natural Sciences has a long history within the education sector. Even within every subject further sub-subjects are established such as molecular biology or genetics. Additionally, we can include the returns of computer sciences (for instance, for modelling relationships or documentation purposes) without neglecting the advantages of hands-on-science. Integration of such a subject-integrative approach with an ICT focus should be obvious to the science teacher training in order to make them competent to the section of needs.

Science education is not taught as a subject in German universities. We even do not have a single word for "science" in the specific term as it is used in the English language. In German schools there is a "Physics Education", a "Biology Education" and/or a "Chemistry Education". Consequently, teachers generally emphasize the individual disciplines, their differences and distinct domains rather than the coordinating and complementary aspects when they mean science education. However, new introduced curricula demand science education although teacher in general are not being trained in this context.

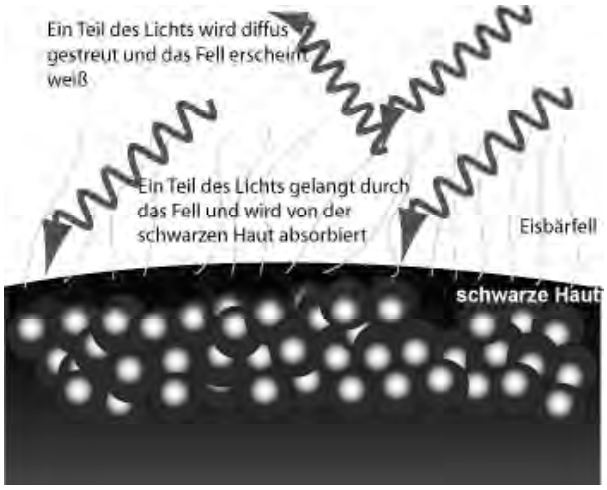
Programme

The unit "Life in Winter" provides a specific example of interdisciplinarity. It is a 6-lesson unit and due to its self explaining structure it could be introduced to every secondary school class (9^{th} grade). Specifically it was designed for the Medium Stratification [Realschule] but is also suitable for a freshman course at university. The participants are working in tandem groups or alone on a computer. The overall structure of the unit is displayed in Table 1. Both subjects, Biology and Physics, are integral part of the programme and are always linked to each other, i.e. the unit is suitable for Physics and Biology classes as well. The central unit builds upon an animal which has to survive harsh winter conditions. Students learn about the biological and physical details and they have to use this knowledge to "design" an artificial animal called "Nigno" (providing sufficient insulation, considering the body size, allowing for nutrients etc.). The students have to take into account the potential loss of body energy due to convection, energy transfer, radiation and evaporation, as well as

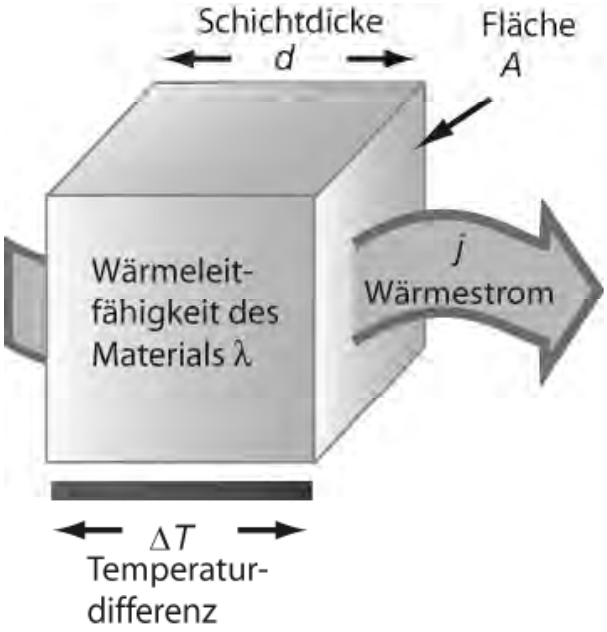
simultaneously the given opportunities to avoid energy losses. Knowledge from both subjects, Biology and Physics, has to be integrated in order to reach optimal conclusions. Although few static diagrams cannot show the design of the interactive programme, for a short illustration, five different scenes are detailed below. Additionally a mapping plan gives an imagination of the integrative design.



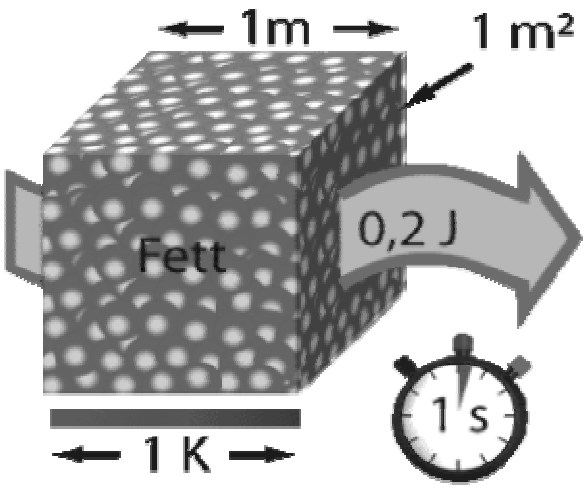
"Interactive" Animal



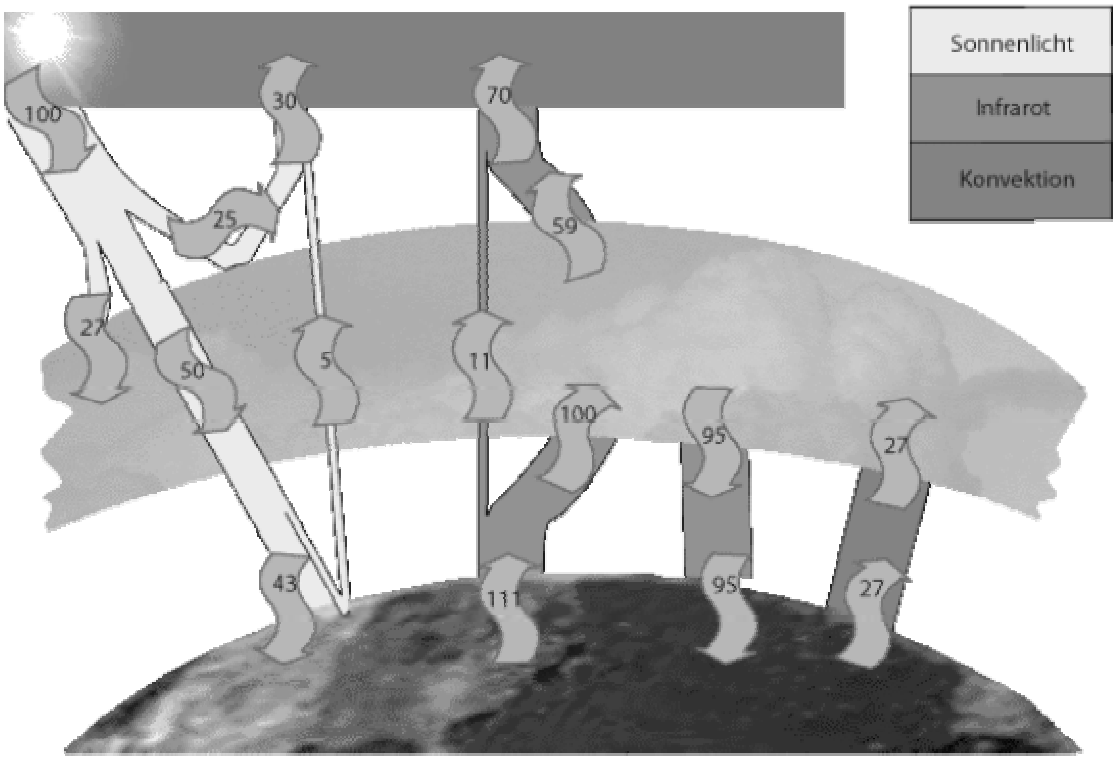
Interactive applet detail of insulation (example of a mammal [polar bear])



Calculation detail of a physical example



Calculation detail of a biological example



Interaction model of energy inputs and outputs in our atmosphere

Many significant concepts in science (not just in biology or chemistry or physics) cross our arbitrary disciplines continuously while discipline-centred teaching builds upon the philosophers of science. Nevertheless, universities around the world house their science teacher preparation programs in individual science departments, leading to separate programs for biology education, chemistry education, and confining them in separate compartments. This department fragmentation escort numerous problems, especially since few teachers have the time or opportunity to study the pedagogy as offered in each of the science departments and in most countries few teachers have the luxury of teaching only one subject. Therefore, the question arises whether trainee teachers should not be offered an opportunity to study with teachers with strong backgrounds in other subjects rather than in disparate discipline-centred programs? This would be even more important due to the lack of any evidence that chemistry teaching relies on different underlying research related to how students learn, how excellent teachers teach, or that classroom climate in chemistry must be distinctly different than the classroom climate in biology or physics.

An important task of Science Education is making science more relevant to students, more easily learned and remembered, and more reflective of the actual practice of science. Furthermore, overcoming the compartmentising of the different subjects is increasingly requested. This approach is accompanied by the belief that most students learn best working with meaningful problems and issues in real-world, and in collaborative groups where communication is of the essence. Additionally, most problems in science are closely linked to each other, for instance, studying photosynthesis is difficult to perform without studying the physics of light, the chemistry of light reactions, and energy flow and use in the cell. Consequently, as in the real world where successful people integrate their knowledge as they resolve the problems they face, children in our schools should learn to integrate all of their knowledge, bringing all of their resources to bear on whatever problem they are facing. Similarly, science topics could feature problems and issues that require the use of specific science concepts and skills from various science disciplines where students are expected to use this same combined language in their responses.

Students should be taught in ways that they recognize knowledge as a powerful means for solving problems and that it can be useful also in everyday life. Therefore learning and instruction should be anchored in meaningful situations and connected with important events (Brandsford *et al.,* 1990).

Furthermore problem solving is seen as a means for learning, not just as a goal. Students should learn a range of topics from all the major disciplines, emphasizing active learning and the simple use of tools such as, for instance, computers. Therefore the described approach follows an object-oriented and conservation-related approach (c.f., bird migration) as well as a process-oriented rationale (c.f., visual process). A selection of those contents facilitates a subject-integrative approach by highlighting a practice-related access, a content-relatedness of factual knowledge, an access to different methods of work and a problem- and hands-on-related access as well. Many students (and teachers as well) complain a lack of skills of teaching integrated science due a lack of knowledge to teach all three subjects simultaneously and of and confidence of science. Consequently, appropriate opportunities to learn in integrated settings are required which enables students to match current standards by being inquiry-oriented, activity-centred, and overtly constructivist in approach. Students should be given sufficient opportunity to develop more maturity, communication, and laboratory and reasoning skills in the context of learning science in an active learning environment. This also belongs to the consequences derived from his studies. An inquiry-centred, integrated curriculum provides students with numerous problems and activities in science to gaining a concrete experience with materials, a systematic development of science concepts from direct experiences, leading to appropriate applications. Many of the activities should include true experimentation. As a result, studying fewer topics with more depth, will lead to better understanding and retention of concepts rather than attempting to cover more material in the same period of time.

Consequently, for the training process of pre-service teacher, the contents focus on

- the use of pictures and illustrations for different purposes in science education (Levin, 1981, Issing, 1983, 1990, Girwidz, 2002) and offer multiple codings. We combine this with an introduction of modern techniques in order to visualize selected contents: Students learn about basic principles of digital photography as well as document adjustment to websites; this includes a designing of real websites as well as its didactical appliance with a science educational framework.
- material development which favour a “situated learning” (Brown *et al.*, 1989, Lave, 1988, Lave & Wenger, 1990, McLellan, 1995), providing a visual access to daily-life situations (including those which in general may not be available within classroom situations). Subsequently contents and problems may easier be detailed in a natural context (which by itself is generally seen as a precondition of a situative learning environment).

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TEACHERS' PROFESSIONAL DEVELOPMENT FOR THE TECHNOLOGY ENHANCED CLASSROOM IN THE SCHOOL OF TOMORROW

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Abstract

This paper discusses the following general questions: 1) what is the role of the teacher in the technology enhanced classroom? and 2) how are teachers prepared for the use of new technology in the classroom? The answers will differ among European countries due to, among other resons, resources, national initiatives, and available infrastructure. The overall goal of using technology in education also needs to be clarified. Is the driving force primarily of economic nature to make education cheaper? Is the overall goal rather to improve the quality of learning? Is it about increasing student experiences? Is it about attracting more students? Does it have to do with increasing the prestige of teachers? Is it introduced in order to increase flexibility in time, place and organization of learning? Or something else? This article is based on results from two EU-projects: E-watch and School foresight as well as innovative ideas and examples of teacher training and development. The EU-project E-watch investigated national policies for e-learning in Europe; the School foresight project included among other activities an essay contest about students' visions of the future school. A study of teachers' visions of the future school was also conducted. There will be no definite answers given to the above questions, but a number of suggestions, opportunities and inspirational ideas presented on how to organize the technology enhanced classroom and teachers professional development.

Introduction

The school of tomorrow is a concern for the whole society. Moving into an increasingly knowledge based society makes a skilled labor force the most important competitive advantage for a company, region or country. Jobs are moving out from Europe, not only traditional industrial work, but also intellectual work such as design, service and support. India and China, but also Russia are fast growing economies, expected not only to engage in low level information technology production and services but also to lead the development in the future (The Economist, 2004:1-8). Europe has a comparatively older population and needs to focus on updating the labor force skills and to build systems for lifelong flexible learning in order to maintain and increase living standards. The European Union has been investing heavily in this area. School standards play an important role in this process. The EU 5th and 6th framework programs targeted among other areas the "School of tomorrow". The total budget was 14 960 Million euro for the activities in the 5th Framework program of the European Community for research, technological development and demonstration activities, 1998 – 2002 **(**http://www.cordis.lu/fp5/src/budget.htm)

In order to design the school of tomorrow one needs to have a vision, a goal. A summary of visions expressed by politicians, students and teachers is presented initially in this article based on two comparative European studies Hansson & Holmberg (2003) and Hansson & Hall (2005). In same cases the visions are converging in other cases different and conflicting goals are uncovered. There is a need for a broad societal debate on the following issues: What is the ultimate aim of education? Why? And then How do we achieve these goals best? These issues are too important to reserve for politicians to deal with alone. This article includes a discussion of teacher opportunities enabled by technology and how to boost teachers' professional development in a cheap, fast and efficient way keeping high quality standards.

Information technology in education: The Perspective of Politicians

The visions of politicians in Europe as expressed in national policies for implementation of information technology in education was investigated by Hansson & Holmberg (2003). In total 30 countries were studied: Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden, the United Kingdom, Iceland, Lichtenstein, Norway, Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia, Cyprus and Malta. One principal question was posed when studying the documents: What are the main aims for implementing information technology in education?

Common motives were: increased teacher skills, increased educational quality, access for all, and increased international cooperation. But this was not explicit in all policies. The national aims were structured into three overall categories: "To increase…", "To protect…", and "To change…". The increase category was by far the most common. It simply means more of something in the existing system. Not critically rethinking or evaluating the current state of affairs. The "increase" category includes: more computers, updating of computers, more internet connections, faster internet connections, increased access for special groups (like the disabled, rural people, old people etcetera), or for some countries like Sweden a policy of "access for all". These aims are focused on technology and infrastructure. However, in a deeper sense, access is not only about access to computers and Internet. One also needs to know how to handle the technology and, in addition, there might be language barriers such as the fact that most information available in software and on the internet is not in the mother tongue and therefore excludes many people – making it non-accessable. Further discussions about language issues related to technology are to be found in Hansson & van de Bunt Kokhuis (2004).

A second set of aims was less focused on technology and more on communication. Information technology in this perspective is a tool for cooperation and partnership in various ways. The goals are: more cooperation between schools and the wider society, more international cooperation, better national integration, more public and private partnerships. Another aspect stressed in many policy documents was increased quality. Increasing quality in the following areas was highlighted: teacher skills, management, educational quality, creativity and innovation e t c.

Most country policies were about increasing something, as mentioned above, but no country mentioned all aspects listed, some only stated one or two goals. Another quite different category was policies not about increasing but rather protecting something which was in danger of disappearing due to information technology and globalization. In the protect-category there were polices about protecting the national language, history and general culture on the one hand and on the other explicit actions aimed at protecting national living standards and economy.

Few countries (in fact only two of the 30) had policies that stressed the need for radical change. However, many aspects of society need to be organized in a fundamentally different way, because the world of today and tomorrow is and will be totally different from the society of yesterday due to the effects of information technology and globalization. Therefore, there is a need to change the whole education system, the view on knowledge and the power relations between teacher and student.

A summarizing figure below shows politicians' aims for information technology in education in different categories: increasing, protecting and totally changing the education paradigm.

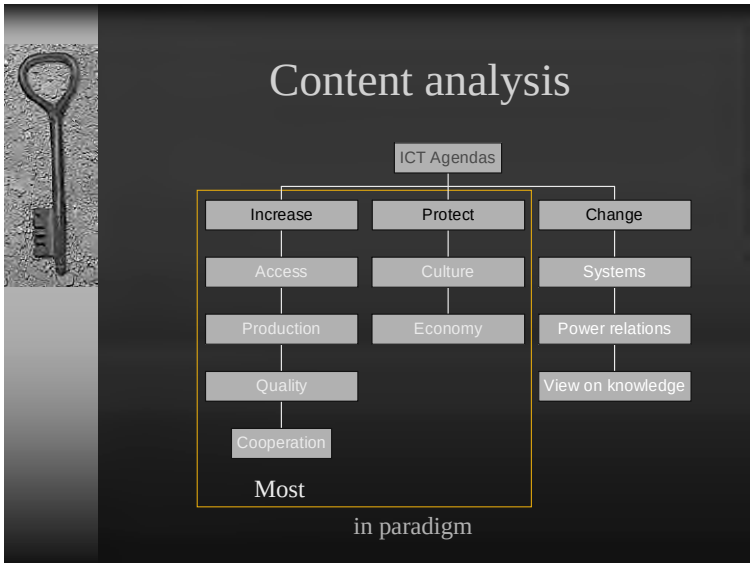

Figure 1. A summary of the principal aims of 30 EU countries national polices for ICT in education

Students' and Teachers' visions

How shall we design the school of tomorrow? What is possible? What is desired? Some tentative answers addressing these questions are discussed in this article based on students' visions as expressed in an essay competition "School 2020" conducted in five countries and interviews with teachers about their hopes and fears for the future school. The essay contest was done in the context of the EU-project *Schoolforesight*[1].

The future school: Students' perspectives

It was surprising to find out that the essays first and foremost focused on meaningful and motivating activities, basic values, and the relations with friends and teachers. The so called "social capital" played an important role in the essays (Putnam, 2001). Social capital is about trust, social relations and networks, aspects that are deemed essential in our society and increasingly so. In fact many of the visions for the future related to this non-technological field could be implemented already if the students' voices were heard. The technological aspect was a second theme. Before talking more about technology and its impact on school, its organization and the changing social relations, one needs to remember the students' principal point – school activities must be interesting, challenging, exciting, relevant and meaningful from the students point of view, if not… all investments in technology in schools will be wasted.

Another surprise when reading the essays was that some student opinions could be compared to workers' opinions about a future paradise: one essay started as follows …" in the future most pupils wish there was no school at all", or stated that they wanted to start at 10 am and have Fridays off. Obviously students of today have mixed feelings about the current school. It is not self evident that school must lock students up during most hours of the day for years and years. There are reasons for keeping them there, but also opportunities for a more flexible learning life in the same way as working life is developing.

[1] With partners in Bulgaria, Estonia, Greece, Rumania, the Czech Republic and Sweden. The students' task was to write an essay about the school in 2020. First a national contest was held and this was administered by Ellinogermaniki Agogi, Greece, S.C. IPA S.A. Rumania, Center for Prospective Studies, the Technical University of Sofia, Bulgaria, Alfa Omega Communications, Estonia and Gymnasium F.X. Saldy in the Czech Republic. The three best essays were thereafter competing for an international prize.

Student visions, as expressed in the essays, could be grouped into three categories: “The Arena school”, “The Virtual School” and “The Technology Enhanced ‘Classroom”. A fourth complementary category could be added to these scenarios, “The Ubiquitous Learning Mode”. The Arena school is characterized as a large, modern, high tech, all purpose school building. The Arena school fulfils all pupil needs, physical, social, technical and educational. There is a cinema, high quality restaurants and cafés, laboratories, science and computer equipment and sports facilities. In this large school complex one meets friends and teachers and other staff members face to face. It is fun and exciting. In fact it seems to be the centre of life and every day is a new adventure. Also off hours are being spent in these facilities. Most essays expressed an Arena vision. There were also some students who expressed doubts about a highly technical school environment, and one student even suggested a total rejection of it, a kind of “back to nature” revolt in the spirit of Jean Jacques Rousseau (1993).

“The Virtual School” is the total opposite vision. In this scenario a physical school does not exist. The school enters the home. From home the student interacts face to face (or maybe better: “e-face to e-face”) with schoolmates and the teacher via large screens on the wall. There is no commuting, no stress in the morning; in fact one can take part in the lessons from the breakfast table. The student who expressed this vision stressed the importance of synchronous visual contact in order to “control” the children, who otherwise would try to get away with things or do other activities. The school day was perceived as a “normal” school day, but with all involved participating from a distance via transparent technology, “they appear to be in the same room”. Most students mentioned the importance of physical activity, especially since computer and screen interactions is a passive mode. The student who drew up the vision about the virtual school suggested that the real life interactions took place after home based lessons. All students gather in the afternoon and evening in the local village or town in order to interact socially and do sports activities. This approach is a kind of distance education, but focuses on real time dialogues and the use of audiovisual technology available to all in their private homes. The expensive school arena is not needed, but instead investments have to be done in private homes. Gilly Salmon (2000,2002) among others has stressed the importance of dialogues in online courses as opposed to ready made content packages, but the technology in distance education so far has been restricted mainly to text chat and asynchronous text via e-mails or forums. The students envision a technology that enables a richer dialogue with face and body language in addition to voice and integration of persons acting from multiple locations.

“The technology enhanced classroom” was another common vision among students. It is simply the traditional classroom reinforced with technology: computers and Internet that enables more independent studies, international cooperation and access to information from a large variety of sources. Since some students who wrote the essays were participating from schools that seem to lack computers for student use, it was a great vision to just get access to a computer. In a European school context the resources are very different between countries – in Sweden, for instance, all schools are equipped with computers and Internet access. But some people think that it will not be desk or lap top computers in the future, but instead more developed mobile phones so called “smart phones” that include all types of information and communication technologies. The student use of mobile phones, which already has a wide range of extra functions such as cameras, sms, Internet access et cetera, is such a problem in Swedish schools that national politicians discuss this issue and are considering legal means for teachers to confiscate them in order to restore discipline. Sweden invests the most in the world in public education, but according to recent studies has severe problems with discipline in the classroom (Swedish National Agency for Education, 2004).

The student essays uncovered three distinct different visions of the future school: The Arena School, The Virtual School and the Technology Enhanced Classroom. A fourth plausible scenario of the future school could be: “The Ubiquitous learning mode”. This vision is learning via the availability of information and communication opportunities everywhere. The availability is there all the time via wireless high speed broad band networks. We can imagine small portable devices, but increasingly the needed equipment is built into the environment itself: in cars, in trains, at airports, hotels, restaurants et cetera. In Sweden, for instance, wireless Internet is already available at a certain hamburger chain covering the whole country. This means that “the classroom”, if that is the suitable term, can be anywhere and also that learning can take place in a lifelong and autonomous fashion in a totally new way.

Even the most remote areas can now be reached via satellite and the infrastructure is quickly improving. “The digital generation” who knows no world without computers will be used to this “language and culture” in a totally different way than the generation born before the computer age. Marc Prensky (2001) even suggests that their brains are structured differently because of their intense use of videogames and because the logics in the digital world completely differs from the logics in the print world.

The future school: Teachers’ perspectives

A group of teachers from England, Greece, Italy, Portugal, Spain and Sweden was asked to write down keywords signifying the future school and to explain and discuss these keywords. The keywords are categorized and abstracted into the general concepts shown in the table below. As we can see there is a concern among teachers that media and technology development might create lazy and passive students with problems to focus on deep learning. Market mechanisms will force schools to be more adapted to work life and less to “academic” learning. Less funding for education and lower teacher salaries in public systems is another perceived threat.

On the other hand some teachers were more optimistic (and in many cases one individual suggested both scenarios). The promises for the future, according to the teachers, were the ability to tailor schools more to individual needs, to use the creativity and producer tools to create more meaningful learning activities and to use media in an entertaining and engaging way with a learning content. The risks and promises with new technology in education are discussed by Burbules and Callister (2000) among others, they emphasize the need for students to develop critical thinking when using Internet material.

One teacher suggested that the future school could be summarized with a number of words starting with ”inter”:

- *Interconnectivity*. Everything is connected: school and work life, school and home. Media and communication channels: TV, phones and computers et cetera. See Pavlik and McIntosh on media convergence (2004).
- *Interactivity* between students and students, students and teachers, teachers and parents et cetera
- *Internet.* More and more of our communication and information is carried by the Internet, for schools: homework, digital libraries and schedules, to mention just some applications.
- *International*. Our world is increasingly international, locally – more immigrants and people with different cultural background to be found in the local schools – and our ability and need to interact with the wider world is important in this context.
- *Interdependence*. In this increasingly international world we are more and more dependent on each other and events even in remote areas can quickly affect our lives. Such issues as the environment, security and health are no longer possible to handle alone.
- *Interdisciplinary*. The merging of old scientific disciplines to new fields of knowledge is constantly taking place. Problem solving is in focus and in order to solve a problem today one need skills and knowledge from a wide variety of disciplines.

Teachers’ professional development

Teaching and learning using information and communication technology can be organized in several different ways depending on purpose and infrastructure. Teachers will use the technology according to the student needs and their own preference. In some cases technology will given added value in terms of better understanding of complex concepts or a more flexible interaction and coordination of activities.

The table below displays four structurally diverse ways of adopting technology in education. These arrangements are also connected to learning theory and teacher preferences on how education should be conducted. Some teachers will only select one mode others will combine and mix approaches according to purpose, tasks and composition of the student group.

In the first case technology is used in the traditional classroom, with both teacher and students present at the same time. This enables face to face interactions and a familiar situation for both students and teacher. In fact this is the situation with the widest "broadband" – most signals, cues and information are at hand. All other situations limit signals and feedback cues such as the whole body language of all involved, face language, eye movements, multiple voices, hyper feedback, multiple computer and projector screens and additional white boards, physical instruments et cetera. In the "same time and same place" situation teacher or students can use technology to illustrate, demonstrate and simulate concepts, perform experiments, add visual information to an oral lecture and the like.

Computers, projector and internet in the classroom accompanying a "classic" oral lecture may be the most common use of technology in education. In fact even conferences about "online learning" are mainly organized as oral face to face lectures to a bigger audience present in the same room. Today power point slides and oral speech are so dominant in conferences that it may hinder creativity, interactivity, spontaneity and other ways of "telling the story". Observing universities and schools projector lead lectures are not as common, but increasingly becoming so. The main factor is that projectors are still expensive, whereas computers are not and the older teacher generation does not know how to produce power point presentations. We may call them the "overhead generation", but many do not even construct overheads for their lectures. In contrast to the new "digital generation", who, without special education, quickly learn how to construct power points due to computer experience from their daily lives.

To learn how to make power point presentation even for an "overhead generation" person would not take more than half a day. The power point slide presentations will be much more elaborated in the future and there might be other programs doing the task better and more efficiently. Interplay with contents from the internet will be more and more integrated as well as interplay with other people at a distance.

Table 1: Information and communication technology related to time and place.

	Same place	**Different place**
Same time	**1. Technology–supported teaching** – Demonstrations – Visual presentations	**3. Synchronous communication** – Videoconference – Chat – IP telephone – Whiteboard – Audio chat
Different time	**2. Technology–supported learning** – Self–studies – Multimedia	**4. Asynchronous communication** – E–mail – E–board – Audio forum

The second case "Technology supported learning", see table, is a situation where we may have expensive technical equipment in a place open for students to conduct self studies at their chosen time. It can be a flight simulator, a special computer lab or computer surgery equipment which is available for students and their independent learning without the supervision of the teacher. A number of learning centers have been set up in Sweden to enable people without computers, video conferencing facilities and internet to conduct distance education. But since computers are becoming cheaper and cheaper and internet increasingly accessed easily and inexpensively everywhere basic

computer equipment is moving into private homes. There is nevertheless some technology that is either too expensive to buy for home studies or to spacious to house in a private room. However, a function not to be overlooked is that learning centers are social meeting places. Even if people have computers at home they often do not have an ergonomic work place or enough space to interact with friends. Also, to leave home and start studying in another place may structure the private and study life more efficiently. The game palaces are an example of this social phenomenon. Even if players of digital games can conduct their activities alone at home and interact via Internet, they often prefer to meet physically and play together in a special game hall.

The third arrangement "Synchronous communication", see table, refers to the situation when teacher and students are separated in space but interact at the same time at a distance. This can be done audiovisually using videoconferencing (increasingly via Internet), text = chat, voice = ip or "traditional" telephone meetings. The technology itself does not determine the pedagogical approach. For instance an audiovisual interaction can be a traditional lecture sent in TV-format or a session where students present and discuss their work. The first model is less interactive and may be running the risk of being a boring "talking head" session, but of course a lecture could also be structured to invite interaction.

It is important to notice the great difference between classroom teaching and audiovisual distance lecturing because of the reduced cues for feedback – how are the students receiving the message and how can the students interfere? Telephone conferences are underestimated means of teaching and supervising. It enables fast and clear interaction and it is a cheap and reliable technology. Increasingly, phone calls are made for free worldwide using for instance Skype or Groove software. Another way of interacting synchronously is by using a common work space online – slides, whiteboard e t c, with or without faces (images still or moving) and with or without voice. Text can be used in a chat forum, but it is more time consuming than voice interaction. The advantage is of course that the text dialogue is saved and can be used to recall the session. This use of technology in education focuses on dialogue and may be contrasted to the previous arrangement, case two, where the dialogue between teacher and student played no role at all, rather the focus being on the interaction between the student and the technology.

The fourth possibility "Asynchronous communication", see table, is also focused on the teaching dialogue between teachers and students. This way of using technology enables teacher and students to be totally free, when it comes to where to interact and when to interact. This creates enormous freedom, but also problems of structuring and solving problems efficiently. Oftentimes an asynchronous teaching mode is said to be independent of time and space, nothing can be more wrong. We are very much dependent on place, but we can freely choose where to work. We always need to be somewhere and this environment poses limitations, what about internet connections, computer availability, printing possibilities and social interaction at home? On the bus? At the restaurant? Abroad? Etc. We are not independent of time either, in fact we need MUCH more time when interacting asynchronously compared to spoken face to face interactions. Log in and read and write takes 7-10 times more than listening and speaking. Also, many more interactions may occur during a day. One teacher had 700 mails from students each day and not even time to sort them into categories. The so called freedom of asynchronous teaching and learning may be a burn out situation for the teacher who can be reached everywhere and at anytime. The solution is to give clear instructions to distance students when feedback can be expected, for instance only to expect teacher responses on Fridays, other days are occupied for other activities.

With this in mind there are many opportunities of structuring information technology for teaching and learning. There is a need for a clear and informative "communication contract" between teacher and student, indicating the basics of the online communication: When? How? How much? About what? It is also important to make clear the responsibilities when online communication fails – who needs to take the initiative in different situations: student or teacher? The more explicit this is the better the working situation for the teacher and the learning situation for the student. However, these are often implicit and non regulated issues which create chaos, misunderstanding and even total break down.

Teachers' professional development for using technology in education will vary across time and space as well. Some countries in Europe have strong national initiatives and others leave teachers on their own to take care of their competence development. There are also generation gaps between "the pre-overhead generation", "the overhead generation" and "the digital generation". There might be less of a problem with future generations because they grow up with and are used to computers and internet. But if our present teachers do not use technology efficiently in the classroom, this will have a negative effect on the next generation as well. Studies have shown that young people have a positive attitude towards new technologies, but are disappointed in the way they are used in schools. Therefore, massive and rapid teacher education programs are of crucial importance. Many initiatives have already been implemented and had positive effects. Still, computers and internet in universities and schools may primarily be used for administration of students rather than for teaching and learning.

How can teachers gain the required knowledge? There is a considerable portion of informal learning taking place, slowly increasing the general digital competence: students teaching teachers, teachers' children teaching their parents, teachers need to carry out a number of daily activities outside school using computers and internet: banc account administration, travel booking, media consumption et cetera. These changes and informal learning opportunities will change teachers' behavior also in the class room.

There are also traditional courses available to teachers, a few hours each week or full days learning a particular IT-skill. There a number of studies showing that the uptake of new innovations follows a trend, first a small group of pioneers, then later the majority and finally the laggards (some will never change). Roni Aviram (2004) has suggested the following categorization of teachers and staff in schools:

- *The conservatives.* Technology in education is fundamentally bad and destructive. Nothing is improved by technology in education, but rather making quality lower. Back to basics and classical studies.
- *The technocrats.* We place computers and internet in the classrooms and see what happens. Assuming only positive effects.
- *The moderates/reformists.* Well, there might be some positive effects in education using technology. We try to improve curriculum and teaching with the add on of technology.
- *The radicals/revolutionaries.* Technology will fundamentally change our culture, our relations and education. We need to change everything – a total paradigm shift is needed (Kuhn, 1996). Schools and universities may not exist in the way we know it today, maybe it is not even needed, when people independently can access and learn virtually everything on their own without formal structures.

Of course we have to deal with teacher optimists willing to change and learn new technologies, but also acknowledge the conservative group who do not want to change. As we saw in the student visions of the future school "Motivation" is the number one factor for learning and this applies also to teachers' learning. If they are not motivated, all resources spent are wasted (Illeris, 2003).

Conclusions

Teachers' professional development for using information technology (IT) as education technology (ET) will depend on national policies, which in Europe are very diverse, and on institutional policies which in many cases are lacking or conflicting with the national policy. Individual independent learning, formal and informal, will be of importance for each individual teacher. Important also is the responsiveness to new generation of students. The digital generation and their skills and needs will have an impact on the teachers' teaching. Teachers' motivation for using new technology is crucial; it can be stimulated by external means such as innovative national initiatives, preferably developed together with teachers and not a pure top down approach. Better resources for education in general

and higher teacher salaries in particular are also important external motivating factors. Motivation can also be attained by reflecting as a teacher: – What is in it for me? How can I improve my teaching using technology? What are the benefits for the students? If the answers are positive change will occur.

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BENEFITS TO THE TEACHERS' DEVELOPMENT FROM THE UTILIZATION OF A GLOBAL NETWORK OF ROBOTIC TELESCOPES – SKYWATCH PROJECT

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Abstract

The SkyWatch[1] project is introducing the European youth in the truly wondrous world of science and technology by engaging school and university students as well as young science amateurs in escalating, challenging and innovative multidisciplinary 'Science Games' combining creativity, intelligence and scientific quest. SkyWatch introduces a pan-European Science Communication and Celebration Initiative, which will reach its peak during the European Science Week 2005, comprising of two main interrelated events. A two-phase European Science Contest concluding to a central European Exhibition and a Best Projects Award Ceremony and a series of popular science distance learning courses (16 'Science Days' overall). To perform project activities, young people are given access to an existing global network of remotely-controled robotic telescopes. The young participants are prompted to organize teams and accomplish science projects, comprising astronomical observations with the use of the telescopes and under the guidance and support of experts. The SkyWatch web-portal launched for this scope is providing access to advanced collaboration and communication tools and educational material of high added value, acting as on-line campus for scientific quests. An Integrated Publicity Campaign covering 28 European and other Countries is implemented. At least 10,000 secondary school students of 28 European Countries, 1,000 university students, 50,000 visitors of science centres, parks and museums and 5.000 visitors (mainly school students) of the central exhibition are expected to participate in the activities of the project. In addition, among the targets of the project is the organisation of an Annual European Award Competition in science and technology and especially in astronomy and physics as well as an Annual International Exhibition where the best results of the competition will be presented. The establishment of a Virtual Community of young people, wider public and the scientific community is the ultimate project objective.

1. Introduction – Objectives

The aim of SkyWatch project is to build on the youngsters involved in a series of science projects in order to create a virtual community of young prospective researchers promoting scientific culture. The SkyWatch project is providing the opportunity to the European youth to access and use remotely robotic telescopes in real time, perform observations, analyze data and results and finally develop and suggest solutions and provide answers to selected research – scientific topics. This is achieved through the utilization of an innovative web-based learning environment. The dissemination of the projects activities will also be served through a European Science Contest on science topics and projects, a series of popular science distance learning courses (Science Days) for the European youth, promotion of concepts and ideas of science of a multidisciplinary nature: physics, mathematics, statistics, chemistry, etc. The young participants are prompted to organize teams (school classes, groups of students, etc.) and design, develop and implement projects and activities with the use of robotic telescopes under the guidance and the continuous support of a team of experts in the field.

[1] The Sky Watch project is co-financed by the European Community, within the framework of Science and Society, FP6-2003-7-013609. The Sky Watch consortium is composed by the following partners: Q-PLAN (GR), EDEN - Open Classroom (UK), Astrophysics Research Institute – Liverpool John Moores University (UK), European Physical Society (FR), Ellinogermaniki Agogi (GR), Stockholm University (SE), SCIENCE PROJECTS (UK) and University of Duisburg – Essen (DE).

2. The SkyWatch Project

SkyWatch project deploys an innovative approach aiming at promoting increased public scientific and research culture. This approach targets to crosscut the boundaries between schools, research centres and science thematic parks and involve users in extended episodes of playful experience and scientific research. The project through its science and technology advances targets to create a 'feel and interact' user experience, allowing for the development of an increased scientific culture open to societal changes and at the same time adequately modulated to the needs and capabilities of each user. SkyWatch approach will engage groups of young people all over Europe in a scientific quest by implementing a set of multidisciplinary scientific scenarios related to astronomy and astrophysics. Young people are given an opportunity to perform and experiment with scientific research and evaluate its impact on society and everyday life. SkyWatch will not act simply as a science demonstrator but primarily as an interactive and vivid initiative where users equipped with powerful real scale research tools are becoming the researchers, the seekers and finally the leaders of the scientific quest.

SkyWatch also provides the opportunity to the young people of Europe to experience the benefits arising from European co-operation in research. The fact that the state-of-the-art instruments and the communication tools are developed by joined trans-national research collaboration is highly demonstrated to every participant and user of the project's activities. Under SkyWatch activities, a powerful European educating and entertaining network will be established. More specifically, school and university students, researchers and scientists as well as the wider public are forming a Virtual Community. Around 50-70 European Schools from 28 European Countries and 30 Universities and Science Centres are participating in this network. Young people are given the opportunity to learn and to be familiarised with the process of trans-national scientific research by performing real life scientific quests, collaborating in science projects with students from other countries, participating in Science, taking Interactive Popular Science Courses and communicating with experts, researchers and teachers from all over Europe.

3. Implemented technology

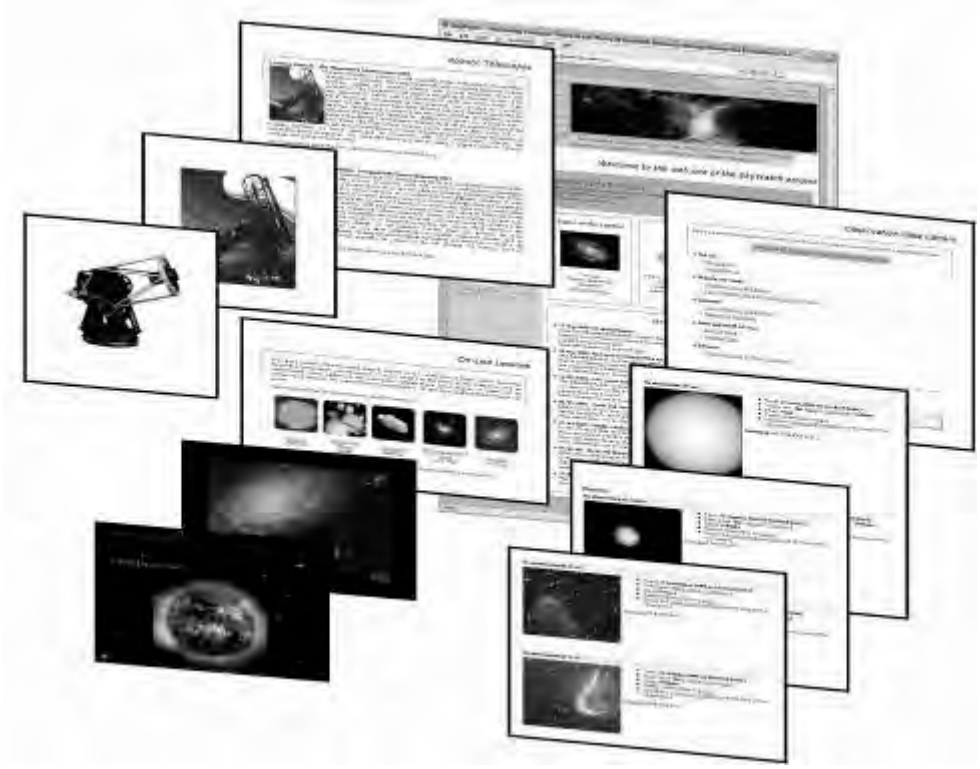
The service is interconnecting a network of remotely-controlled telescopes that includes the Liverpool Telescope of the Liverpool John Moores University (the largest robotic telescope in the world) located on the island of La Palma in the Canaries and the two telescopes of the Observatory Science Centre at Herstmonceux (UK) with more than 100 schools from different European countries are connected to the telescope and performing day and night observations facilitating the two telescopes of the Observatory. Each observatory hosts at least one telescope server to store information that is local and relevant to each telescope at that observatory, including telescope properties, schedule, and availability. This information is stored in a virtual telescope object.

The Web services offered by the SkyWatch Web Portal include:

Main Content & Functionalities of SkyWatch portal
• Information on the contest and on the project • Supportive material and research results for the users – participants • Discussion forums • On-line supporting sessions & educational material • Electronic newsletter • Information and links with Science Week portal and with other science projects • Support creation & operation of virtual learning communities • Special utility to support presentation of the Interactive Popular Science Courses (within the context of Science Days activity)

The Communication Platform serves one of the main aims of the SkyWatch project which is to move students and young researchers into scientific research. Thus, just as in the professional world, a request for an observation must come as a part of a project, which includes all the steps of the scientific investigation (hypothesis, experimentation, analysis of the data, conclusions). In the framework of the project a scientific question is posed and the learner seeks to answer and outlines the observations to be made to address some aspect of that question. In some cases the users come to the web platform having already decided the scientific questions and the associated observation requests. In many cases, however, they have not. In these cases the web platform guides learners through the process of asking a question, providing a dynamic view of available information based on their choices along the way. The Communication Platform includes:

- Collaborative activities for on-line users: These activities are offered through:
  - Chat activities
  - Groups (e.g. teachers and students)
  - Direct Dialogue facilities
- Advanced Messaging Services and Interactive activities: that allows for a) communication between the user and an expert (e.g. astronomer) as well as among the users, b) users to participate in learning experience, c) interactive project preparation (formulate a question, define observation, reporting and presentation of results, review) and d) notification services about new available educational scenarios etc.



The SkyWatch Web Portal

Through a very simplified procedure every participant is able to perform an observation or to submit a request. The user has the possibility to choose the telescope according to the needs of the observation. Additionally, the user has to check the weather conditions in the area through information provided by the SkyWatch Web Portal.

4. The SkyWatch Web Portal

The SkyWatch portal is developed in the English language in order to facilitate the whole process. The contest participants have the ability to find information (the competition guides, the evaluation criteria, description of the selection procedure), all the needed research results that already exist and supportive material. It additionally includes an up-loading mechanism that allows for the contest participants to up-load their projects. Discussion forums and on-line support sessions are created to facilitate the whole process. The contest participants will receive a regular electronic newsletter throughout the duration of the project to keep them updated with activities in all science projects and interesting new items posted on the SkyWatch portal to create – support virtual learning communities of young people, educators and researchers and involve them in extended episodes of scientific inquiry. The virtual communities of learners, students, teachers and researchers are involved in the proposed activities through the SkyWatch portal. The SkyWatch portal provides an online campus with well proven products and tools such as: multi-lingual repositories of educational material as well as communication and collaboration tools. The portal is acting as the meeting place of the virtual community of young prospective researchers. They should become the promoters of the best practices and contribute to the final validation for products and criteria. The portal evolves in parallel with the projects' life cycle and it is being regularly updated with all the latest information about the contests, the courses and the Science Days.

The Upload Mechanism supports users for presenting their work on the web. The SkyWatch platform uses a multimedia database system (Library) for storing and retrieving the multimedia knowledge data that consists mainly of text and images. Examples of resources include projects, lesson plans, educational material for teachers, images. As each resource comes into existence, its components are encapsulated in XML and are further annotated with appropriate metadata protocol, to permit queries for future use. The database stores and manipulates the following knowledge data types:

- The images of the astronomical objects
- The mapping information between images of real objects and knowledge data scenarios
- The knowledge data scenarios of the e-learning experiment
- The multimedia objects (text, audio, images, video) composing the knowledge data scenarios

Following the "open systems" philosophy, the SkyWatch Database allows for maximum access and use by the educational and scientific community by embracing technologies which promote interoperability, such as XML, and RDF. The system is built on open web standards, facilitating use by new users and integration of new telescopes.

5. Scenarios for science projects

As the proposed activities are open for different categories of users (secondary school students, university students, young science amateurs as well as the wider public, e.g. visitors of science parks) the scenarios of use vary significantly in order to cover the different needs and interests. The scenarios address science topics from multiple viewpoints and are also integrating other fields of science including social, human and economic sciences. These scenarios are one of the basic vehicles for the promotion and the dissemination of science and technology to the young participants. The scenarios are categorized in two main groups. The first group includes scenarios for the specific educational purposes of the school or university curriculum (scenarios to be used in formal learning settings). The second group includes more open scenarios as they are designed for the wider public (e.g. the visitors of a science centre). The young participants organize teams (school classes, groups of students, etc.) and design, develop and implement projects and activities with the use of the telescopes and under the guidance and the continuous support of a team of experts in the field. All the projects will be presented and assessed following specific criteria applied by the project's scientific committee. The consortium of the project has set up the evaluation methodology and the selection procedure adopted during the contest.

The content of the scenarios is presented in an open and modular way allowing for additions and improvements at any time. The activities offer the users of the telescopes the possibility to study interdisciplinary concepts of physics, mathematics and astronomy by using a modern research laboratory; allow students to study and teachers to support the learning process.

6. The SkyWatch Scientific Contest and Science Days

Scientific Contest

The SkyWatch project's objectives are focused on raising public awareness for scientific and technological developments by motivating the wider public to actively participate in the process of realizing the beneficial impact of science and technology on our day-to-day lives. One way of successfully raising awareness and interest on science, especially among the youth, is to present science and scientific research through challenging activities combining intelligence, existing knowledge and innovation. Within the framework of the abovementioned objectives, a scientific contest in the general field of astronomy and astronomical observations had already start.

Participation

The Sky Watch contest is addressing three age groups. The contest topics, evaluation criteria and presentation format will be common for each age group, but eventually there will be nine (9) final winners, three (3) from each group. The age groups are defined according to educational level and perceptual abilities, as follows:

Age group 1: *Students < 15 years old*
Age group 2: *Students between 15 and 18 years old*
Age group 3: *Adults*

All participants are allowed to enter the contest either individually or in pairs (projects developed by groups of more that 2 people will not be accepted).

Contest first phase (7 months)

During 1st phase, the young participants will use a data base of astronomical observations conducted by the telescopes of the SkyWatch network of observatories. According to their selection from the pool of the 5 suggested contest topics, the participants are expected to design, develop and implement projects and activities with the use of the provided telescopes' data base and under the guidance and the continuous support of a team of experts in the field.

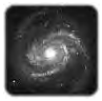
The five topics are as follow:

The Sun

Planets and Moons

Asteroids

Birth and death of Stars



Galaxies

The contest participants will be asked to create scenarios and well-defined small projects to express these ideas and to seek for answers to scientific issues, with the prerequisite that all these projects will require the use of the robotic telescopes of the network to create the data and to subsequently analyze and interpret them, formulating their final answer or viewpoint that will conclude their project. All projects will be presented and assessed following specific criteria that will be applied by the project's scientific committee. An initial selection procedure will be established that will lead to the creation of

a pool of 30 projects. This evaluation/selection procedure will be followed independently for each of the three groups, resulting to the 10 best projects from each group that will qualify for the 2nd phase of the contest. As a deliverable for this stage, a detailed scientific dossier will be developed per selected project, comprising the essential scientific knowledge, relevant information, and all the available material.

Contest second phase (1 month)

The participants corresponding to the 30 best projects will be granted access to the network of the robotic telescopes in order to be provided with new research material comprising observations on demand.
Based on these "ordered" observations, the participants will further develop their submitted projects or even create a new project on the same topic. These 30 integrated projects will be evaluated by the project's scientific committee who will finally come up with the three best projects from each age defined category. All the projects will be presented in the closing event in Athens on November 2005.

Science Days

Furthermore before and during the European Science Week 2005 several *interactive sessions on popular science* (in the form of lessons in *a virtual popular science school*) will be organized based on (a) science topics and educational material related to the contest topics and (b) the results of the scientific – research scenarios that will be developed by the contest participants. The programme will include *10 Contest Science Days* during which contest participants will have the chance to discuss and interact with experts on their projects and *6 Public Science Days* (e.g. Astronomy Days, Physics Days, Mathematics Day) during which the youngsters and the general public get additional information about the latest achievements in the relevant field and the results of selected contest's projects and ask questions. Young people will have the opportunity to learn and to get familiarized with the process of scientific research and at the same time to find out more about the work of scientists and technologists. To ensure success of this initiative, teachers of the participating schools and the science centers educators will attend an online seminar course in order to receive the appropriate information for the realization of the proposed activities.

7. Expected impact – future plans

School teachers, students, university students, educational authorities, wider public e.g. amateur astronomers and relevant associations, visitors of science centres and science museums across Europe will participate actively on projects core activities and/or be aware of the demonstration - publicity activities in science and research topics in astronomy and astrophysics. Concerning particularly the participation of the young school students, SkyWatch project is expected to actively involve them in the scientific process providing a hands–on experience of the scientific process. The "Science Contests" will constitute the driving theme and concept for attracting young people's interest on science to enjoy a 'feel and interact scientific experience' that involves learning, competition and entertainment and highlight the excitement of the scientific quest. Through the proposed activities the project aims to raise the European youth's interest and awareness on science and technology as well as to create and support virtual learning communities of young people, educators and researchers and involve them in extended episodes of scientific inquiry and science understanding. In the long run, the project targets to establish an Annual European Award Competition in science and technology and especially in astronomy and physics as well as an Annual International Exhibition where the best results of the competition will be presented in a different European city each year.

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THE ROLE OF TEACHERS IN THE DESIGNING OF THE CLASSROOM OF TOMORROW BY USING ADVANCED TECHNOLOGIES TO CONNECT FORMAL AND INFORMAL LEARNING ENVIRONMENTS – CONNECT PROJECT

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Abstract

The main objective of the CONNECT project is to develop an innovative pedagogical framework that attempts to blend formal and informal learning, proposing an educational reform to science teaching. The project will create a network of museums, science centres and schools across Europe, to develop, apply and evaluate learning schemes by pointing to a future hybrid classroom that builds on the strengths of formal and informal strategies. The proposed approach will impact upon the fields of instructional technology, educational systems design and museum education. It will explore the integration of physical and computational media for the design of interactive learning environments to support learning about complex scientific phenomena. The project will be implemented on an advanced learning environment, the Virtual Science Thematic Park, developed upon emerging technology that will allow for ubiquitous access to educational and scientific resources. The CONNECT project will evolve through a systematic, multi-step assessment process involving the collection and interpretation of data. The current paper presents the project's framework, the initial ideas and the future plans of the consortium.

1. Introduction

During the last decade some attempts have been made to evaluate the impact of efforts and investments made in Science and Technology Education worldwide, for example the Third International Mathematics and Science Study (TIMMS, 1994) and the Programme for International Student Assessment (PISA, 2000). These two large scale studies have explored the achievement and the attitudes towards Science and Technology (S&T) of the students' population in many countries of the world. The main findings of these studies are that the average achievement of the students' population is relatively low in most of the Southern European countries. Additionally while the vast number of students hold positive attitudes towards S&T at the early schooling stages (70-80% of the 4th graders in all countries), this situation is considerably moderated at the latest stages (8th grade). These findings suggest that the educational systems need to shift from the traditional paradigm of the teacher-directed learning and the dissemination of knowledge to the learner-centered curricula that promote the development of lifelong learners who can think critically, solve problems and work collaboratively (King, 1996). Sfard (1998) argues that learning becomes a process of discovery and participation based on self-motivation (informal learning) rather than on more passive acquaintance with facts and rules (formal learning). The importance of visualisation and of hands-on experiences as vital components to the learning process has also been stressed (Bransford *et al.* 1999).

From the beginning of the nineties there has been a considerable growth and development of the research on learning in science museums. Changes in accepted paradigms and definitions of learning have resulted in studies that point to the considerable richness of learning that have the potential to emerge from experiences in informal settings. There was widespread acceptance of the cognitive,

affective and social value of experiences in museums and similar institutions (Rennie & McClafferty, 1996), and Falk and Dierking (1992) had drawn attention to the physical, social and personal contexts in which learning occurs.

Exploring the integration of informal learning experiences within the formal school curriculum could make an important contribution to the field of science education by helping students to develop critical capacity and deeper understanding of the concepts underlying scientific investigation. It will further provide students with first-hand experience of the ways that technology can both serve and inspire scientific investigation. This will later affect their career choices and will provide a scientifically qualified workforce (Falk, 1999). It will furthermore significantly enhance the learning of science for diverse and heterogeneous populations of future citizens, promoting the public understanding of science and the development of lifelong learners who can think critically, solve problems and work collaboratively (King, 1996).

2. The connect project

The CONNECT project[1] is a step towards an ambitious comprehensive educational reform, pointing to a future hybrid classroom that builds on the strengths of formal and informal strategies. It is an innovative approach that crosscuts the boundaries between schools, museums, research centers and science thematic parks and involves students and teachers in extended episodes of playful learning.

The CONNECT project is a joint initiative of pedagogical, cognitive science and technological experts, museum educators and psychologists, that research the possibilities of using advanced technologies for educational purposes. The CONNECT project develops an active learning environment the Virtual Science Thematic Park that functions in two distinct and equally important, from a pedagogical point of view, modes: the museum mode and the school mode.

The Virtual Science Thematic Park allows for ubiquitous access to educational and scientific resources and will incorporate all the innovative use of technology for educational purposes. The partnership aims at providing students with a variety of learning methods that will incorporate experimental, theoretical and multidisciplinary skills that will eventually enable them to become independent learners. The suggested educational scenarios include field trips (virtual and conventional visits to science museums and parks) that are tangential to the curriculum, pre- and post-visit curricular activities (including the use of internet resources), 'minds-on' experiments and models of different kinds into everyday coursework heavily involving 'real' remotely controlled experiments in the "student-friendly" and engaging environment of a thematic park or a remote observatory.

The working hypothesis of the CONNECT project is that the amendment of the traditional scientific methodology for experimentation with visualization applications and model building tools will help students and learners in general to articulate their mental models, to make better predictions and to reflect more effectively. The CONNECT project will take advantage of the fact that students enjoy visits to museums tremendously and that the resulting increased interest and enjoyment of science activities constitute extremely valuable learning outcomes that persist over time (Ayres & Melear, 1998). The CONNECT project will provide students with observations and experiments that have the potential of showing to them that some of their beliefs can be wrong; will create the circumstances where alternative beliefs and explanations could be externalized and expressed and design activities that give students enough time to restructure their prior conceptions.

[1] The CONNECT project is co-financed by the European Community, within the framework of the Information Society Technologies (IST) priority, Sixth Framework Programme and the National Science Foundation (NSF), USA.
The CONNECT consortium is composed by the following partners: Institute of Communication and Computer Systems (Greece), Fraunhofer Institute of Technology (Germany), INTRASOFT (Belgium), University of Duisburg Essen (Germany), Vaxjo University (Sweden), University of Bayreuth (Germany), University of Birmingham (UK), Ellinogermaniki Agogi (Greece), HEUREKA (Finland), @BRISTOL (UK), Evgenides Foundation (Greece), ECSITE (Belgium), Institute for Learning Innovation (USA), Weizman Institute of Science (Israel), International Environment and Quality Services S.A. (Greece), Ministerio da Educacao (Portugal), Universidade do Minho (Portugal).

2.1 Pedagogical innovation of the CONNECT project

The CONNECT project is developing a new science learning scheme by introducing a technologically advanced approach for teaching and learning and by connecting a wide range of learning environments (school, home, science museums, research centers, science thematic parks exhibitions) and bridging the theoretical and applied aspects of every day personal activities.

In order to learn science in meaningful ways students need to see connections to familiar problems relevant and important in their daily lives. Additionally, situated learning fosters the ability to transfer acquired knowledge to a variety of different situations. Situated learning is an essential component of acquiring the ability for self-organised and self-regulated learning. The schools of the CONNECT project will provide opportunities for the development of a competence to learn and an ability to be an autonomous learner in the future. This includes the development of meta-cognitive learning competences like e.g. elaboration strategies or learning strategies and their application and usefulness. The learning processes are embedded in communicative situations where teaching science offers good conditions for fostering communication and cooperation in students' experimental practices. For the content orientation the planned teaching topics are based on a broad field of knowledge and applications. The teaching sequences are built up in a way that student knowledge can increase and link, in other words be “constructed” by them.

The educational material and the adopted instructional strategies are tailored to the abilities and aptitudes of different types of learners. The development of the educational scenarios aims at providing materials and instruction that gives reality and concreteness to scientific concepts (Hofstein & Walberg 1994).

In the light of the above the “basic scenario principles” of the CONNECT project can be summarized as follows:

- Personalization: The learning tasks need to be related to the interests and background of a wide variety of different learners and facilitators and to built upon these individual differences, tapping into intrinsic motivation and providing opportunities for choice and control.
- Interactivity: The tasks should be “learner-centered” and should provide learners with opportunities to engage actively in the experience.
- Collaboration: Learning is often enhanced by collaborative efforts. The tasks should promote such collaborative learning, through opportunities for collective work on problems or challenges.
- Self-regulation: Teachers should help students to plan and monitor their learning, to set their own learning goals and to correct their errors.
- Authenticity: The learning tasks should be as real-world and authentic as possible.
- Learning Strategies: When possible, the learning tasks should employ effective learning strategies, e.g., the use of advanced organizers, the use of dynamic explanations, making explicit connections between visible and invisible phenomenon, making explicit connections between linked-phenomena which take place on different scales (micro vs. macro), etc.

Another important aspect of the CONNECT project is the promotion of ubiquitous access for students and teachers that will be able to access to the Virtual Science Thematic Park; to visit the exhibits and the experiments; the research laboratories and the advanced scientific instruments. Thereby science education will act as the mediator among people in different countries reducing at the same time prejudices and stereotypes and increasing social cohesion. The direct interaction with science or the doing of science reflect a fundamental pedagogy of the museum to provide learners with personal and direct experiences which can build upon in their own ways. Students will experience the phenomena presented in their own terms, freely choosing what to attend to and interact with, depending on their prior knowledge, interest and expertise. It is important also to note that in the science museums and science centres the exhibits and the related phenomena are embedded in rich real world contexts where visitors can see and directly experience the real world’s connections of these phenomena.

Finally, a virtual learning community of learners, students, teachers, museum educators and researchers who are involved in the project has been created and will have the possibility to communicate and to collaborate via the CONNECT system.

2.2 Scenarios of Use

The Virtual Science Thematic Park requires the use of augmented reality tools which visually explain with the help of virtual objects projected onto the real setting the physical phenomenon manifested by an experiment inside the museum. By this way many "invisible" parameters in physical phenomena (e.g. forces, fields, waves, charges) will be visualised and presented in the eyes of the students augmented on the real experiments. Haptic feedback could add to the experience of complex physical phenomena. An example is the representation of Lorentz force in space. Other scenarios include, giving life to static exhibits by animating parts of it (e.g. the cloud creation in the water cycle, meteorological movements, tectonic plates movements, sea currents, the propagation of sound waves, etc.) or performing on-line astronomical observations (Sun movement, planets and stars, solar and lunar eclipses, etc.) with the use of a robotic telescope. Furthermore, wearable systems will provide an additional wealth of information, linked to dedicated databases.

The add-on of the augmented exhibit, compared to a conventional exhibit, is that the students wearing the CONNECT system have at their disposal additional wealth of information. The real exhibits are mixed in their optical view with the 3-D visual objects and representations that the system is producing and embedding into this augmented world through their glasses. In this way all the important parameters of the experiment, all the abstract symbols, which are normally represented in drawings after the experiment, can be visualised. This interactive hands-on experience is recorded on the students' wearable computer for later use. The next day at school (post visit procedure) the students are sharing their personal experience of the visit to the museum with their fellow classmates by projecting it onto a video screen. The fellow students will be able to make a virtual visit to the museum and follow a different tour or make different choices to the same tour through the Virtual Science Thematic Park. Various collaborative activities (discussion forums, mini-projects, writing reports etc) follow the visit in order to provide students with the necessary time and the appropriate tasks to better understand the new information

3. Expected Impact

The goal of the CONNECT project is to redefine the conceptual framework of education, by designing learning environments and implementing pilot experiences that use state-of-the-art digital technologies. Such environments would encourage reflection and collaboration and draw their pedagogical value from the cross-over between education and entertainment.

The CONNECT approach will impact upon the fields of instructional technology, educational systems design and museum education.

- In the field of instructional technology, our research will examine alternative instructional systems that attempt to blend informal and formal learning and to situate learning in real-world contexts.
- In the field of educational systems design, the CONNECT Virtual Science Thematic Park represents an example of designing new systems from the ground up. As such, it may inform current burgeoning theory in the process of educational systems design and in systems theory-such as the SIGGS theory (King & Frick, 1996). Additionally, the CONNECT approach will provide information for one of the key processes of educational systems design, transcendence: it will create knowledge regarding a new class of alternative schooling that will be informative to future educational designers.

- In the field of museum education, the CONNECT project will correct three deficiencies that are restricting current reform efforts to expand the educational role of museums: the limited number of model programs, the absence of a body of professional literature, and the lack of contact with the broader field of education. Indeed, the CONNECT project provides a framework for a closer and more effective collaboration between museums and schools, while keeping intact the strengths of these different educational environments. By describing and analyzing the functionalities of the virtual thematic park and by creating operational terminology, the CONNECT projects aspires to guide the design of future museum-school collaborations and to document efforts that seek to bring the worlds of formal and informal learning closer together.

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WEARABLE TECHNOLOGIES IN EDUCATION: THE LAB OF TOMORROW PROJECT

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Abstract

The recent technological advances in embedded and wearable computing have found their way into many applications that support and enhance everyday human activities. Wearable technology can sense human actions and adapt accordingly, depending on the context of use, providing a new way of human-technology interaction that augments human cognitive abilities and performance. The use of wearable technology in the context of education is new, and has been mainly linked to the concept of experiential learning. For instance, students and their teachers can use mobile and wearable computing technology to perform daily activities and, through the measurement of human performance, understand the natural world around them. Teachers can link such life-like related experiences to promote experiential learning within the context of the formal educational curriculum. The Lab of Tomorrow project has developed the pedagogical framework for the successful application of the emerging wearable technology on teaching science through everyday activities. This paper reports on specific pedagogical and human factor considerations undertaken during the design of the Lab of Tomorrow wearable technology, in order to determine appropriate methods for assessing human performance. The study of human performance is used by teachers to encourage students in understanding basic scientific concepts by planning and implementing simple scientific experiments, forming and validating hypotheses, and elaborating in the formulation of new ideas for further research. We conjecture on how, in the future, wearable technology can support experiential learning activities within the formal educational school curriculum.

1. Introduction

Over the past ten years, we have been witnessing a rapid technological development of embedded and wearable computing technologies, leading to innovative applications for the novel use of computers in our daily life [1]. In a broad sense, wearable computing technology can be defined as information and communication technology that is subsumed into a user's personal space, "a small body-worn computer system that is always on and always ready and accessible" [2]. Wearable computing presents a paradigm shift in human-machine interaction. Such technology, usually attached to the human body, can sense the environment, provide useful measurements of activity-related human actions, and adapt according to the context of use to augment human cognitive abilities and performance [3]. A variety of applications exist, where wearable computing technologies have been successfully employed to support human activities and improve task-related performance. Wearable computing devices have been implemented for activities such as mechanical vehicle maintenance support [4][5], support of automation in factories [6][7], engineering technical inspection, such as bridge [8] and aircraft inspections [9], patient monitoring [10] and support of paramedics in the emergency services [11], military combat and command & control operational assistance [12] [13], scientific fieldwork [14], etc.

The use of wearable technologies in the context of high-school education is new. A successful application of wearable computing technologies in education has been demonstrated through the Lab of Tomorrow (LoT) project, an EU funded research exercise (IST-2000-25076) in the Framework V Programme. The aim of the LoT project was to develop a pedagogical framework for the successful application of the emerging wearable technology in teaching science through everyday human activities. Students and their teachers can employ mobile and wearable computing technology to

perform daily activities and, through the measurement of human performance, understand the natural world around them. The use of wearable computational tools and instrumented artefacts in the assessment of human performance, within the context of physical activities, encourages students to understand basic concepts in science by planning and implementing simple scientific experiments, forming and validating hypotheses, and elaborating on the formulation of new ideas for further understanding of everyday experiences in the natural world. Teachers can then link such life-like related experiences to promote experiential learning [15] within the context of science education and as part of the formal educational curriculum.

In this paper, we report on the relevant technological, pedagogical and human factor considerations for the development of wearable technology in the context of high-school education. Through the analysis of specific examples of using the Lab of Tomorrow wearable computational tools and instrumented artefacts for physics, sports and physical education, we conjecture on how, in the future, wearable technology can support experiential learning activities within the formal educational school curriculum.

2. Supporting formal curriculum education through an experiential learning approach: the role of wearable technology

John Dewey, the renowned American philosopher and educator, strongly advocated that "… there is an intimate and necessary relation between the process of actual experience and education." [16]. The concept of linking individual experiences to one's learning has led to the development of experiential learning theories and models [15][17][18], which consider the process of "learning by doing" achieved in a variety of human activities and everyday contexts. The most well know model of experiential learning is that of Kolb [15], which breaks the process of leaning in 4-key stages: (a) concrete experience; where individuals encounter an every day experience, followed by (b) reflective observation; where individuals consider that experience in a reflective way in relation to their personal knowledge and other life experiences, forming the way to an (c) abstract conceptualisation; where individuals can describe their experience in terms of generic concepts, principles and rules, so that they can test the implications of these concepts, principles and rules with (d) active experimentation when new situations (i.e., new concrete experiences) arise.

Such experiential learning models can be applied by high-school teachers, in a controlled manner, to encourage a hypothetico-deductive approach to science education, where students through observations and use of evidence can conceptualise abstract scientific concepts. For instance, by using an artefact or tool to perform a specific human activity, pupils can form a concrete experience that relates to an observation of a phenomenon occurring in the natural world, resulting from that activity. By reflecting on this experience, pupils can be encouraged to form hypothesis that might conjecture on the cause-effect relationships observed through their concrete experience and then conceptualise the principles and rules that underline their observation. Through active experimentation, they can test these principles, by creating new contexts of use for the artefact or tool.

Evidence originating from large-scale studies [19][20] shows that an experiential learning approach is beneficial in the development of the modern science education curriculum in high-school level, while it is desirable to be implemented with the use of technology-enhanced solutions [21]. In the Lab of Tomorrow project [22], we hypothesized that embedded and wearable computing technology can be an ideal vehicle for implementing technology-enhanced experiential learning in science education. The main premise of our hypothesis was that such technology, either embedded in everyday artefacts or subsumed in a person's personal space through clothing and on-body attachments, can be useful in sensing, recording, processing and transmitting data relating to human activity. The concrete experiences relating to the observation of such data would allow pupils to reflect and to conceptualise principles that relate to Newtonian physics, principles that could be used in the design of new experiments and thus lead to the creation of new concrete experiences.

3. Designing wearable technology for science education

In the initial stages of the project, and in order to facilitate the creation of concrete experiences relating to the observation and manipulation of human activity data by pupils, we have used sensor, computational and commutations technology to be embedded in sports appliances (e.g. an instrumented football) and in cloth, (e.g. a specially modified instrumented shirt, the SensVest [23]). Both types of embedded and wearable technology were designed for the appropriate collection of meaningful data relating to human physical activities, in order to be transmitted and stored for further analysis and manipulation.

In particular, the SensVest is a novel item of wearable physiological monitoring system [24] that measures, records and transmits specific aspects of human physical activity and function (such as heart rate, temperature, movement, etc.). The prototyping and implementation of the SensVest had followed a participatory design approach, in order to identify appropriate scenarios of use that can facilitate an experiential learning framework for physics and sports education. The device includes an array of sensors that can be used to passively record data that relates to specific activities of the wearer, without requiring the users to perform either some extraneous activity or manipulate a tool or artefact in order to collect the data. The choice of type and number of different sensor devices, their positioning and embedding within the cloth, have been realised in a way to create a multiple-sensing device that is safe, comfortable and usable as wearable technology for monitoring complex activity in physical education. In addition, the design is robust so to sustain damages that might originate from demanding and strenuous physical activities. Our design was further informed by the identification of important human factor considerations derived from usability/wearability evaluation trials of the technology in different contexts of use [25]. The above mentioned features make the SensVest (and its subsequent pre-industrial evolutionary prototype development, the SensBelt[1] wearable system) unique, when compared with other commercial wearable systems that usually perform limited (single-sensor) physiological monitoring (see figure 1).

In order to study particular basic principles in Newtonian physics (such as force, displacement, velocity and acceleration), basic principles relating to human physiology and performance in physical education (such as heart rate and temperature), and more complex principles relating to both physics and physiology (e.g., energy expenditure, cardiac output, etc.), we have selected sensor devices and technology that could be easily mounted on a shirt or the human body, be lightweight and easily transportable within the real-world environment, while their cost remained relatively low and affordable for educational purposes. Simple accelerometer devices have been used for the measurement of acceleration and the derivation of physical measurements of force, displacement, and velocity. The use of simple heart monitors and temperature sensors, have allowed us to deliver measurements of human heart rate and temperature, and from such measurements derive energy expenditure, while allowing pupils to understand concepts of human physiology, such as cardiac output [23]. The following two examples demonstrate how the technology can be used in experiential learning for understanding simple physics experiments and for interpreting human activity to infer performance in physical education.

[1] The SensBelt Wearable System has been developed and designed as a pre-industrial prototype by the R& D Division of ANCO S.A (44, Syngrou Avenue, 117 42, Athens, Greece), one of the participating partner SMEs in the Lab of Tomorrow Consortium.

(a) (b) (c)

Figure 1. (a) The initial prototype of the SensVest wearable technology, as demonstrated at a Teachers' workshop in context of the Lab of Tomorrow Project, (b) the SensVest, a physiological monitoring device of human activity in sports' trials (cycling and treadmill exercises) and (c) the pre-industrial evolutionary prototype development of SensVest, the SensBelt Wearable System.

By measuring acceleration, accelerometers can provide observations that relate directly to Newtonian physics. As such, we have investigated the use of body worn accelerometers in order to introduce the concept of acceleration and the graphical representation of its measurement in high-school pupils. In particular, according to the requirements of the UK's Key Stage 4 Double Science, pupils need to understand the concept of acceleration as change in velocity per unit time and that only unbalanced forces can alter the acceleration of the moving object (since balanced forces do not alter the velocity of a moving object). Additionally, pupils would need to distinguish between positive or negative velocity and how changes in direction can be shown in graphs. During a fieldwork experiment, we participated in a teaching session, where 12 pairs of students, aged 14-16, were introduced to the concept of acceleration, its relation to velocity and their graphical representations. For every pair, one learner wore a wrist-mounted accelerometer from the SensBelt wearable system and the other watched their activities. The learner with the accelerometer threw a ball twice and both learners watched the acceleration graph of the throwing hand on the visual display of a laptop. The learner was asked to use a darts style throwing action. In this action, the upper arm is flexed towards the horizontal and the forearm vertical, the throwing action is achieved by extending the arm at the elbow. In this way, there is minimal movement at the shoulder, it takes place primarily in the sagittal plane, and the throwing action is as linear as possible to reduce rotation of the accelerometer and the gravitational effect such a rotation may have on the readings.

After throwing the ball, both learners talked with the teacher and participating fieldwork researcher about the graph's characteristics and compared it to a velocity graph that was generated by integrating the accelerometer data using Microsoft® Excel 2000 (Figure 2). In particular, pupils were encouraged to think if the throwing hand moved with a positive or negative acceleration, with a positive or negative velocity and if it ever changed direction. By throwing the ball twice, one throw further than the next, pupils could distinguish the changes in the graphical representation of the movements corresponding to different acceleration measurements. Learners were able to repeat the movement without the ball and see how their movement affected the graphical representations. Such physical interactions with the graph strengthened the link between their own, concrete movement and its symbolic representation and encouraged them to conceptualise the meaning of acceleration, in terms of Newtonian Physics.

Figure 3 shows an example of using the SensVest accelerometers to record the movements involved in abseiling. With an accelerometer mounted on the chest, the trace represents whole body movement. During an abseiling activity the participant climbed a tower up three ladders. This is demonstrated by the increased activity on the trace. At the top of the tower the abseiling equipment is attached to the user, and as the user is static there is little activity. The tower is designed so that during decent there is an initial slope at approximately 60 degrees (first lean back), which then goes out to a vertical 90 degrees (second lean back), after a slight readjustment between the two slopes. As the user leans out from the tower, the accelerometer value drops. This is in response to the gravitational effect on the

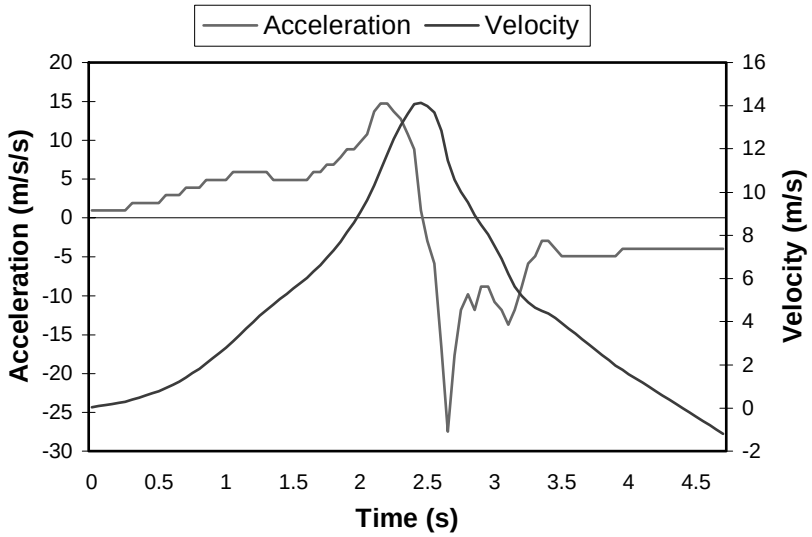

Figure 2. A graphical representation of the measurements of acceleration and velocity of a ball throwing movement

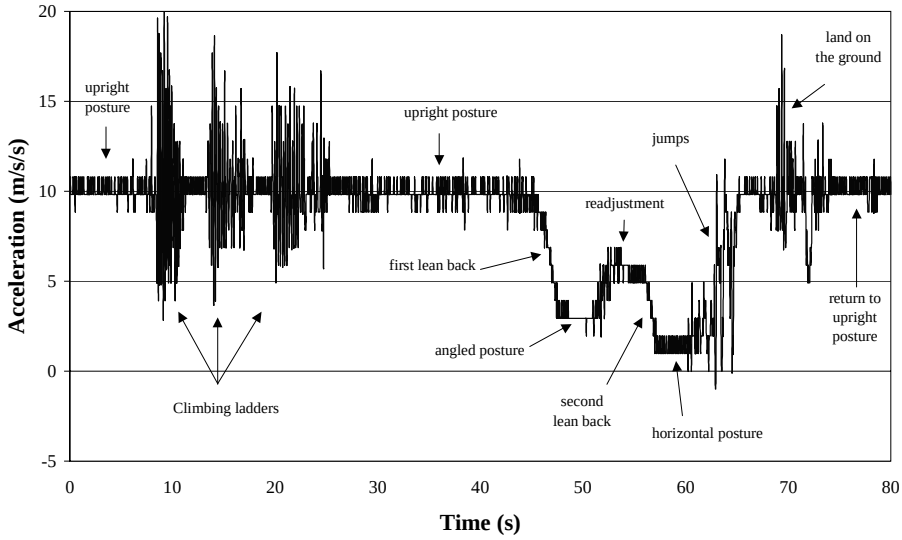

Figure 3. Accelerometer trace of abseiling

accelerometer as acceleration drops from 1G (when the user is vertical) towards 0G (when the user is horizontal). The final stage involves jumping down the tower during which there is a gravitational effect as the user tends towards a vertical upright posture and a dynamic effect due to the increased body acceleration as the user kicks off and collides with the tower. Finally, as the user lands on the ground there is a large amount of body accelerometer action, with a return of the baseline value of 1G (10m/s/s) as the user is fully upright. As it can be seen by this example, a trace of accelerometer data recorded for activity analysis can be used to break up the activity into its constituent parts, determine the timings and sequencing of actions within an activity, highlight key moments and help determine what physical activity a person is carrying out at a specific time during the specific exercise. Such an approach encourages experiential learning in the context of physical education.

4. Concluding remarks

Our account of the relevant technological, pedagogical and human factor considerations for the development of wearable technology in the context of high-school education has shown us, through specific examples, that it can support experiential learning within the formal educational school

curriculum. The experience acquired from the development of the SensVest and other associated embedded and wearable computing technologies can inform the future design and implementation of wearable technology for technology-enhanced learning.

However, the use of such technologies must be considered with respect to their limitations. For instance, in the case of SensVest one has to take into account that accelerometer devices are affected by gravity; as such their orientation must always be taken in to account during the design of experiments or the gravity effect must be assumed to be negligible. Using temperature sensors, subdued in the human body, requires that the user be aware that the temperature value is affected by ambient conditions and so may best be used for assessing relative changes and not as an accurate measure of body temperature per se. Another important set of limitations relate to the mounting of technology (wearability) on the person. Innapropriate design can lead to impairment of movement, while there are associated risks with having electronics in the vicinity of the human body. Appropriate wearability and usability evaluation trials should always be conducted in order to achieve a refinement of the technology and identify its fitness for purpose.

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FACTORS OF SUCCESSFUL IN SERVICE TEACHERS' TRAINING: HOW PRACTITIONERS EVALUATE THE E-LEARNING PERSPECTIVE

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Abstract

This paper summarizes some of the main findings of a field research on how Greek primary and secondary education teachers evaluate the intangible costs and benefits in utilizing e-learning in in-service teacher training. In the research design, about 60 qualitative factors, (system and/or activity attributes) related to e-learning processes were identified through an extensive bibliographical review. In order to validate these factors of success or to further reveal additional ones, we conducted field research with a representative sample of Greek primary and secondary education teachers. The quantitative analysis of the data gathered, was used to establish the validity of the factors examined, as well as their relative importance and ranking. In addition, through an open question, some additional factors (training system attributes) were identified as important for the overall effectiveness of a training program. The most important of these factors concern participants' characteristics, competences and needs, the program's pedagogical approach and institutional issues. This research verifies many of the relevant theoretical suggestions and also provides a full set of benchmarks for training program's success assurance. Most of the research findings are consistent with many principles of an effective teachers' professional development.

Introduction

Teachers' *professional development* is a field that encompasses a very wide range of activities: from developing teachers' competence and skills, to improving their knowledge and promoting opportunities for innovative practices. This is usually implemented through several informal and semi-structured procedures (such as self-study, self-practice, collaboration with colleagues, group-work, etc.), or through other more formal and typical learning and training systems [1] [2]. By offering opportunities for professional development, policy makers and institutions affect teachers' practices and consequently student achievements. Lifelong learning and professional training are both considered as very important determinants of teacher professionalism, which is in turn associated with school improvement, and the effectiveness of the educational system as whole. Although a very small proportion of public expenditures go for teachers' training [3], their professional development through continuous in-service training has become a strategic issue, due to a series of political, social, economic and technological reasons [1] [4]. From an economic point of view, the cost of developing the human resources is a significant part of the overall cost of the educational system, and the cost-effectiveness of teacher training is seen as affecting the efficiency of the system as a whole. [5] [6]. All of the above issues are being today reconsidered in view of the important role which *information and communication technologies* (ICT) have come to play and especially the importance which e-learning applications have assumed in the development of new forms of teachers' in-service training.

Methodology for Identifying Factors of Success for e-Learning Teacher Training

Evaluation of teachers' training programs, especially in cases of ICT utilization, entails typical multi-attribute / multi-criteria assessment procedures. We propose that for a holistic evaluation it is necessary to assess the impact of a variety of *qualitative attributes of technological applications* ("intangible" cost and benefit factors) on the program's effectiveness, and to combine this assessment with an analysis of the

more *quantitative elements*[1] traditionally examined in the literature. That is, qualitative attributes must in any evaluation be taken into consideration as impacting on the program's stakeholders, (trainees, trainers, administration people, etc), as well as on the institutions themselves.

In order to identify the *basic axes of evaluation* of a *teacher training program* and its corresponding *attributes* we conducted an extensive review of the major theoretical and empirical approaches to the professional development phenomenon [7] [8] [9] [10]. Basic training models were reviewed, as well as theories of "continuous learning" and of adult education, and their respective pedagogical paradigms [9], particularly constructivism and its foundations in experiential learning [11] [12] [13] [14] [15]. Most of the theories examined describe and interpret the relation between learners and their environment although they look at the phenomenon from different point of view. Moreover, by reviewed theories and research findings from the field of *cognitive psychology*, we identified aspects of the new learning environments which impact on learning outcomes [11] [16]. We also examined the literature on principles of effective policy making in the area of teacher training, defining corresponding factors of success [1] [2] [9]. Lastly, we examined theoretical and empirical evidence relating to the role of ICT in general, and the specific role of educational technology in particular, as impacting on the development new forms of distance education programs (e-learning), and identified factors of success and models of evaluation of such programs [17] [18] [19] [20] [21] [22].

Having *identified* these *factors of success of an e-learning teacher training program*, we proceeded to *validate* them using data from Greek primary and secondary education teachers. At the initial exploratory stage we employed qualitative research techniques (focus groups and in-depth interviews), in order to construct a questionnaire, which was distributed -during the year 2004- to a representative sample[2] of Greek in service teachers (n=350). The respondents were asked to rate each factor[3] on a 0-6 ratio scale (with word anchors at both ends). The main result of the quantitative analysis was that all factors included were assessed by the teachers as quite important for the effectiveness of teacher training programs, thus validating the research instrument (mean: 4,082 – 5,621 in a range of 0-6). After a scale transformation (the absolute values became a relative rating scale) and a normalization computation, we estimated the weight of each factor. The weights were taken as *indicators of the importance of each respective factor, relative to the total value* assigned to a training system or program. The teachers were also asked to respond to an open question regarding any additional factors of success of a training program, providing the required data for a further qualitative analysis, the most important aspects of which are presented below.

Research Results on Practitioners' Preferences and Priorities

Based on the review described above and in accordance to the benchmarking methodology [23], we first constructed a list of 60 factors which were to be evaluated as benchmarks of a "successful" training program by the teachers.[4] The most important axes along which these factors were aligned are the following:

- Participants' socialization and cultivation of interpersonal relations.
- Personal, psychological issues related to distance education and e-learning setting.
- Factors concerning the personal and social characteristics of participants.
- Customization according to participants specific needs. Personal satisfaction from the participation.
- Equality and flexibility in access as far as time and place are concerned (access for everyone).
- Accessibility to "information" and "learning content".

[1] The evaluation of quantitative attributes (monetary or no-monetary cost-benefits) is a more explicit procedure. Cost-benefit, cost-effectiveness and costing analysis are some of the methods used for such an evaluation.

[2] Representative as far as specific attributes is concerned: level of education (primary, secondary), age, sex, specialization, district area, etc.

[3] The original factors finally have been expressed by a set of 60 meaningfully worded questions.

[4] All these factors have some relation to the ICT utilization in new forms of education and training. (Their presentation in detail is avoided because of size limitation.)

- Time availability and requirements. Timing issues and flexibility on an individual basis.
- Program's pedagogical approaches and learning and instruction styles.
- Learning content issues: subject, quality, customization, and media form.
- Participants' motivation, programming and control over the education procedures.
- Participants' experience and knowledge on ICT and e-learning environments.
- Level and quality of technical support offered by the institution.
- Labor issues, considering teachers as employees or professionals. Assurance of specific employment/professional benefits.
- Network and data security issues, personal data handling, copyright issues, etc.
- ICT infrastructure issues (adaptation, compatibility, availability, upgrade, etc).
- Relations with media or learning content vendors, (flexibility, independence, etc).
- Institutional issues, concerning their organization, administration culture and effectiveness.
- Indirect, social or economic impacts of the program (externalities).

Of these sets of factors, the two groups which were rated by the respondents as *the most important* were the following: (i) *equality issues*, that is, *access* to continuous training by all teachers, so as to overcome regional, economic and social inequalities, and (ii) *pedagogical issues*, relating mainly to new modes and situations of learning and to the need for establishing a linkage between theoretical knowledge and practical in-class applications. The first set of factors appears to expresses the teachers' view that an e-learning mode of training has the potential of improving the access and widening the scope of teacher training programs. The latter, confirms the acceptance on the part of teachers of the important shift towards constructivist didactic practices, particularly in the field of adult education.

On the other hand, the two groups of factors rated by the teachers as *the least important* for the success of an e-learning teacher training program were: (i) the *duration of a training program* and the time required for teacher participation in it, and (ii) the *interpersonal relations and communication* established among participants, namely building and preserving relations among participants, pursuing learning methods such as group-work and in vivo face-to-face communication among participants during the training. The first set of factors must be viewed as an expression of teacher apprehension toward the potential of "downsizing" training programs, and of their own desire to continue pursuing their professional development through training. The second set of factors presents us a very interesting research finding indeed, as the absence of in-vivo communication and the restrictions to carrying out group and collaborative work are generally considered as some of the most important disadvantages of e-learning programs. The fact that the teachers downplay the importance of these factors is most likely a reflection of their own culture and experience acquired within a traditional educational system such as the Greek one.

Examining the differences between the two *sub-groups* in our sample, primary and secondary education teachers, we found that the teachers in primary education rated all factors highly, something which does not hold for those in secondary education. Although this outcome merits further study, it does appear to signify an increased sensitivity on the part of primary school teachers towards pedagogical/instructional issues on which they have acquired theoretical knowledge, something which does not apply to Greek secondary school teachers who are simply trained in specific disciplines and have no systematic pedagogical training. Comparing the responses by *gender*, we found very few differences, the most important of which was that women, to a much greater degree than men, attributed great importance to the fact that e-learning programs offer improved opportunities for further training to people with family responsibilities, reflecting directly the actual position of women teachers in the Greek social context. The same factor also constitutes a valid differentiator among *people with or without children*. As far as the *age* of respondents is concerned, we found that older teachers attributed greater importance to organizational and instructional/pedagogical issues, probably because they are more experienced professionals and accustomed to traditional learning modes. On the other hand, the younger ones focused more on social issues and on the e-learning potential for

ensuring social and economic equality, probably because they are just beginning their professional career, working in geographically remote places and they are economically and socially disadvantaged in comparison with their older colleagues. They are also more digitally oriented and optimistic about the capacities of technology to support diffusion of knowledge.

Turning to the factors which were *additionally suggested* by the respondents, the most important finding is that there were *no other factors suggested* regarding ICT utilization, apart from those already included in the questionnaire. This finding is considered as further validation of the research approach and its instrument. After a qualitative analysis (text analysis and conceptualization) the factors proposed by the respondents were categorized across the following axes: (W=Women, M=Men, S=Secondary Educ., P=Primary Educ.)

Topic/Issue	W/S	M/S	W/P	M/P	Total
Training connected/related with the every-day work	9	0	3	5	17
Trainers' competence, skills and subject knowledge	3	5	2	1	11
Effective design, organization and administration	5	5	1	3	14
Trainee personal or socioeconomic issues affecting his/her participation, commitment, etc	4	6	3	3	16
Improving the access and equity by handling obstacles	6	7	5	9	27
Program and participants evaluation and certification	2	4	0	2	8
Institutional/organizational issues	1	2	0	0	3
Requirements in ICT and infrastructures	2	3	1	1	7
Total suggestions	32	32	15	24	103

Many of the respondents recommended establishing direct connection and a dialectical relationship between training program aims and content and the needs of the practitioner in everyday class work. According to their view, the most important factor of success of a training program is its ability to explicitly relate theory to specific instructional methods and conversely, to lead to the construction of new theoretical knowledge on the basis of teacher practice. Teachers also considered the media format and the learning technology employed as playing a very important role. The availability of sufficient infrastructure, (at the training centre, the school and the teacher's home), was also viewed as essential for improving the whole system's efficiency. Respondents suggested customizing training procedures, in order to render them adaptable to teachers' personal needs and to institutional goals. They also propose establishing continuous support after a training program ends, thus reaffirming the important role which continuous teacher training can play in their professional development.

According to the respondents, the trainer and his/her characteristics are important aspects of a successful training program. First of all, his/her expertise on specific subjects and other training skills or credentials, are considered as minimum qualifications for assuming a trainer's role. Besides that, the trainer's personality and the methods he/she implements in the program (style of instruction, workshops, group working, etc) are thought to affect participants' interest and commitment. Trainers, teacher believe, must have in-depth knowledge of the "real" classroom, as well as enough experience as teachers themselves. Thus it is considered necessary for trainers to have secured the right training and qualification from authorized institutions and training centers. Personnel selection procedures, and particularly issues of meritocracy, were also stressed as important by the respondents.

A very interesting finding with respect to the *trainer* is that teachers appear to have conflicting views as to his/her role in the modern learning environments, and particularly in the new ICT-mediated learning processes. Some teachers stress the need for a very active, almost traditional role of the trainer in teacher e-learning, whereas others view him/her mainly as a facilitator to self-learning, and yet others do not consider the trainer as an important element in e-learning programs at all. Exploratory, constructivist learning and the trainer's new role in such a process obviously diverges from the sovereign role which the trainer has had in traditional instruction. This contradiction is made

yet stronger when considering the respondents' demand for trainers that are "experts" in their field. This antinomy may be solved within the framework of new forms of education, where the mediated role of technology does enable a synthesis of independent and autonomous action on the part of trainees, with a strengthened leading role of the "expert" trainer. This issue must be further analyzed within the context of the new division of labor in education, where the work of the typical trainer is broken down into partial activities, carried out by different participants or sub-systems of the new educational organizations.

The design and organization of training programs proved another point of interest. Teachers focused on the program's themes and on how its design and syllabus are connected with trainees' needs and competence. They indicate that in order to ensure that the whole setting will be compatible with these needs, the program's administrators must survey the target group of trainees and identify their actual preferences. They also stress the need for training organizations to collaborate with school administration authorities and teachers associations so as to be assisted in defining the program's goals and methodology. The respondents also pointed out time-scheduling problems and suggested that trainee groups must be informed early enough about the subject and the agenda of the program. This way, teachers will be able to select what is of their interest and compatible with their personal needs and obligations. Another topic raised was trainee commitment and his/her motives for participating in training. Motivation and positive attitude cultivation were considered as important prerequisites for an efficient training program. As trainees have different levels of knowledge, experience and engagement in training procedures, it is by the teachers suggested that a program must be flexible and adaptable to these diverse characteristics of the participants. Even technology-mediated instruction (e.g. e-learning) requires some kind of readiness on the part of trainees who are not digitally-literate.

Ensuring or facilitating the access to training was also stressed by the respondents. "Training for all" is considered by the teachers to be the main strategic goal that an educational system must guarantee. It means, among other things, training programs for all teachers irrespective of place, time and money constrains. Some of the measures suggested for fulfilling this goal were: teachers' financial support, working time deduction, utilization of new technology, well-organized and time-scheduled procedures, etc. Additionally, collaborative learning and local initiatives were proposed as alternatives of centralized, large-scale programs. As far as the evaluation and certification issues are concerned, they seem to be overlooked by Greek teachers, as the related suggestions and claims were very few and poor in content. Respondents mainly suggest that trainers and the program as a whole must be evaluated directly by the trainees, as well as indirectly by assessing the school effectiveness and the work of the trained staff.

Conclusions

This research on a representative sample of Greek in-service teachers, verifies many of the critical dimensions of a program's designing and administration that the theory has suggested. It is also validates all the provided factors of success which are related with the ICT utilization in new forms of training. Most of the research findings are relevant to the theoretical background of this study and consistent with many principles of an effective teachers' professional development. On the other hand, practitioners' experience basically comes from traditional (in training center) programs, where the typical in-classroom instruction is the dominant model. The lack of experience on alternative forms of education, justifies many subsequent questions and doubts.

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E-LEARNING PROFESSIONS

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Towards a circularity of teaching/learning processes based on the classification and definition of new professional figures involved in network teaching: roles and competences, even though strictly linked to processes and products based on greater interchange and functional liquidity, contribute with their typical collaborative characteristics to give a unified approach to research, thus overcoming the fragmentation of the knowledge, typical of the modern society.

1. The future of intellectual professions

In the late 1990s, *Nuovo manuale delle professioni culturali (The New manual of cultural professions* published by Utet (De Biase *et al.,* 1999) was prospecting a dynamic social outlook, in a state of great ferment.

The emergent professions concerned above all the free time activities, education, arts, assistance, professional and company learning and required competence which would guarantee competitive advantage both at personal professional level and at corporate level – competence addressed to Kowledge Management and to ITC: knowing how to organize learning, knowledge, documents, more and more on a meta cognitive level, typical of the human capital; knowing how to generate, spread, benefit from *granular* products, re-usable in integrated and immaterial virtual environments. Besides, *Memorandum sulla formazione aperta e a distanza (Memorandum on the open and distance learning)* (CE, 2001) had emphasized the convergence of these interdisciplinary sectors as foundations of the *knowledge society* and of *tomorrow's education.*

In just over ten year the social, economic and research scenery has given to the market a series of new professional figures, either created ad hoc or contaminated which, in order to face the globalization challenge, have combined the learning paradigms with information technology, in a statuary but quite often informal condition.

While there is an intensive constant increase in the political parliamentary discussion about the reforms of professions, which have been at a standstill for a about a year and a half, which witnesses a series of collective subjects involved in order to give the same dignity to the official system and to the associative system, the Società (Company) Business International (SBI), in collaboration with the Economist Intelligent Unit, with Leonardo Business Consulting, presented in Rome 6 and 7 October last a Report on the *Competitività del Sistema Italia (Competitiveness of the Italian System)* .

At the same time on the 6 and 7 October in the Sala delle Colonne della Camera dei Deputati (Hall of the Parliamentary Chamber) in Rome, the Università telematica "Guglielmo Marconi" started a systematic and perspective discussion with similar European and international Universities about the combination of didactics and research on the e-learning modality (Briganti, 2003).

It is surely not a mere coincidence that in the national context, and concerning the same prospect, the issue is being discussed simultaneously by the business world, the real driving sector for e-learning, and by the university, the second sector involved in the economy of e-learning.

The BSI *Report* shows how "in 2004 the world economy should have the highest growth rate since 1984" (Veronese, 2004), but "in the passage of recorded data (from 2000 to 2004) to the predictions reaching 2009, Italy, in spite of a slow improvement, will lose positions in the European and World *ranking.* From this springs the need to increase the education in more advanced modalities, which are more competitive, more market oriented and at lower costs than the face-to-face education. Hence, in

the wake of these predictions, it is easy to infer that *lifelong learning* – as it is hoped for in the *Lisbon Strategy* – in spite of being far from actual practice, is bound to become more and more the life and soul of the professional training/learning. That is because the shifting of attention, already present in part, from technologies to people, after the first enthusiasm for the internet and IT, focuses on the economic competitiveness and on upgrading and retraining of staff, confirming as the winning strategy of the *net economy* the strengthening of the "knowledge capital". Besides, *Learning as a resource for change* (Censis, 2003) represents by now the recurrent theme of any reflection which involves, at the moment or in the future, economy and professions. It not a coincidence that the Colap, Coordinamento delle libere associazioni professionali (Coordination of professional associations), urges the request for the authoritative public recognition and regulation of professional figures of emerging competences of unregulated activities. For this, the Convention *Sviluppo e futuro per le professioni intellettuali italiane (Development and future for the Italian intellectual professions)* and the project *Professional Development & Forum* (Milan, 2003) can be considered the starting points of the official identity recognition of a series of professional figures operating in services for companies, in the health sector, in the *well-being* sector, in the sector of communication and of unconventional medicine. These sectors more than others have contributed to the new figures, evolved from the old-time trades, but above all the consideration should be given to the sectors which for the cooperative and specialized way of working have broken up the consolidated roles in order to reassemble *teams of functional competences*, thus shifting the definition of professional identity from the official qualifications (diplomas, and university degrees), including specialized qualifications to the *liquid* operative professional process (Bauman, 2002) in constant upgrading and modification.

Among the different professional figures, our point of view, i.e. the point of view of an Institution which operates in IT modality, is interested in the *on-line educator*, because his/her transversal features place him/her both among the new emerging evolving or hybrid figures and among those *liquid* professional figures, which are manifold and molecular, therefore typical of post modern society.

The *educator* as a *synthetic label*, which includes several roles, evolved from traditional and new forms aiming at a unique system of objectives, is considered among the professional figures which operate in services for the company; today the business company – and the year 2004 confirms the growing trend – is the sector which favours most, even if at slow pace, the choice of e-learning for the internal learning/training and for the market development. Therefore the *e-learning educator* is a professional figures which belongs to a competitive team, with multifaceted professionalisms, regulated in the learning market only in accordance with the stereotyped roles of teacher or tutor.

Alongside of the business company, also the university, and, to a certain extent, the school, are operating with their specific features towards a critical overview which concerns in particular the traditional roles of education: teaching, production and certification of contents, *assistance* to study and to research: the teacher/author/editor, the tutor who orients towards knowledge and in-depth study.

2. The Italian market

Even if a precise definition– according to Cedefop (2002) – does not yet exist, the e-Learning sector is in a *mature settling-down period*, not only at the market level, but also at the level of setting up specific platforms of theoretical reflection, of research and of didactics. But its use is still far from being widespread.

Some data help us understand the economic and cultural importance of the phenomenon.

The bank Piper Jaffray estimates for 2005 a business turnover of 46 billion dollars of on-line training. The Italian contents on the Web seem to cover only 250 million Euros for the production, against 25 billion Euros of the total value of the world production.

However, in this new economy Italy is seen as a *clear importer* of digital contents; the Italian web users represent 4% of surfers, whereas the Italian contents do not exceed 1%. It is only by referring to

these data that it is clear that the tiny Italian production does not even reach the small potentiality of the national surfers.

In general the school and university sectors as compared to companies and public administration represent marginal shares of the e-learning market, even if its incidence on the education spending is rapidly growing: the e-Learning market in 2002 was 3,8%; at the end of 2003 it was about 8,2%.

1 Companies and public administration
2 Schools and universities
3 Consumers

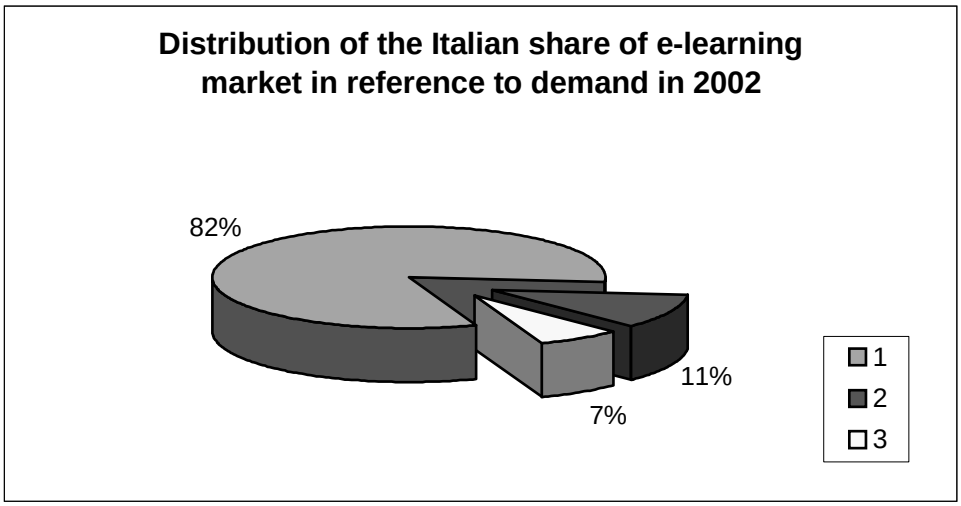


Figure 1. 2002, sector distribution of e-learning

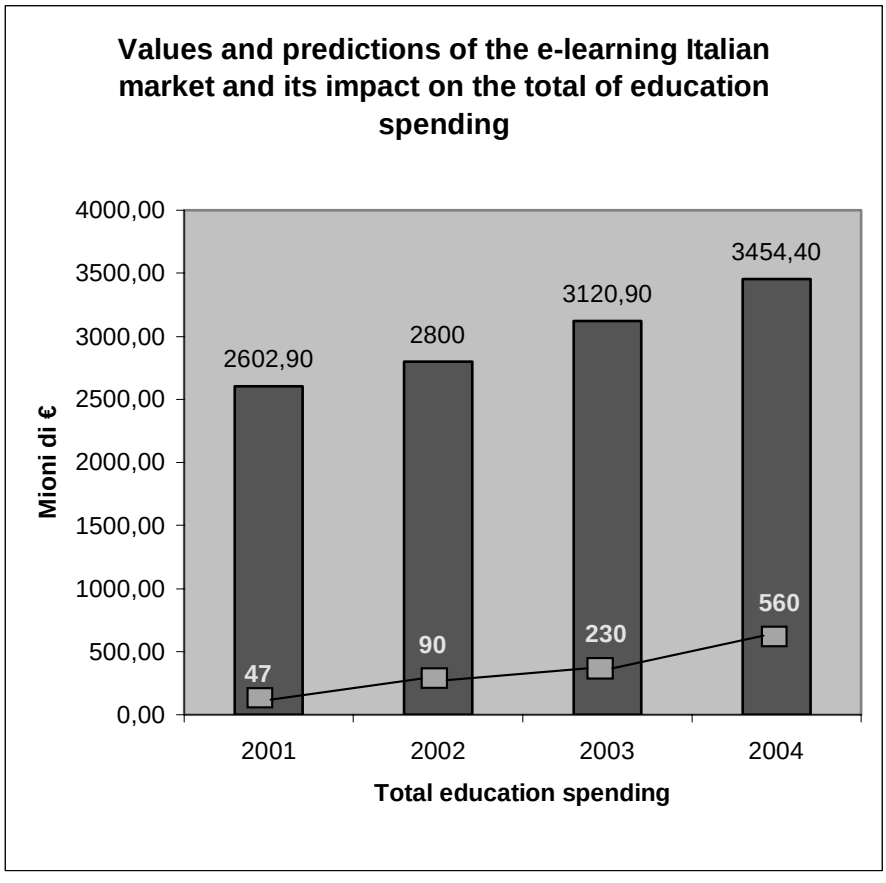


Figure 2 2002, e-learning market and education spending

As a matter of fact, in order to move the market the minimal basic conditions are necessary, i.e. the instrumental competences of using the computer and of language knowledge; besides, a more convinced and widespread culture of life long education" must be promoted and favoured. The Censis, from this point of view, describes a discouraging situation:

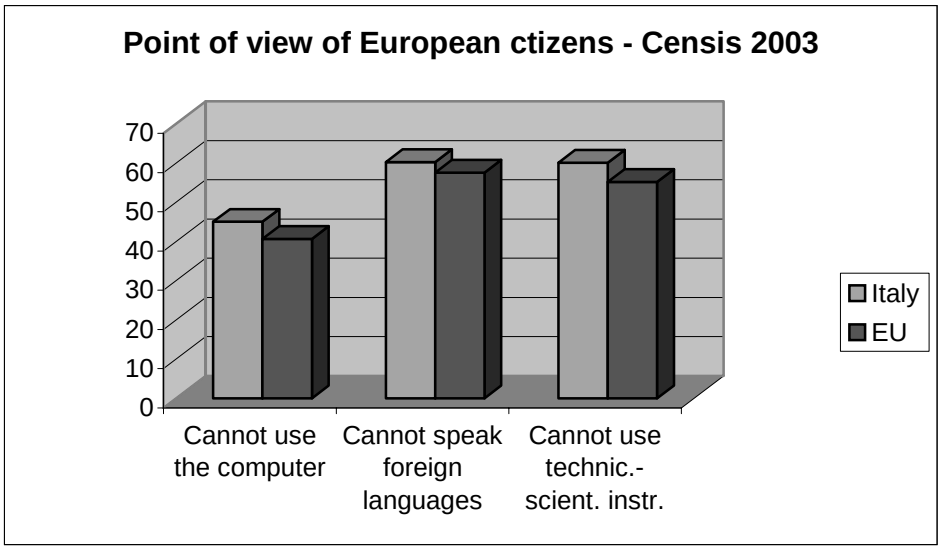


Figure 3. The point of view or European citizens (a)

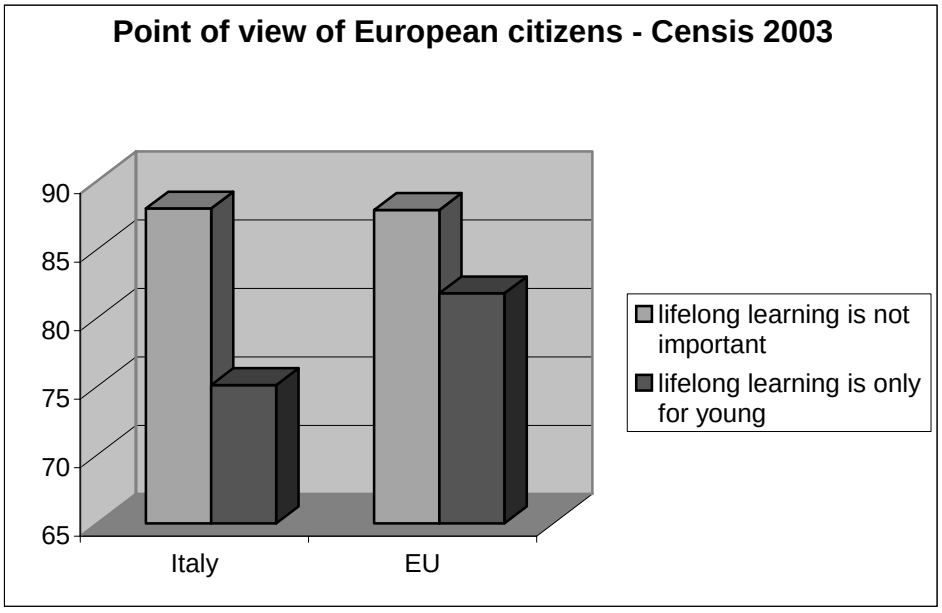


Figure 4. The point of view of European citizens (b)

In the EU (15 countries) there is still a large number of people who are not familiar with new educational opportunities; and the possibilities of demand/supply of on-line learning are still open. The belief of the analysts that we are in the mature period of e-learning does not seem to correspond to an objectively full market, with clearly defined professions. And while we are waiting for the publication of conference proceedings of the 2nd e-Learning Summit on Value of knowledge, held in Milan on 13 and 14 July last, promoted by "il Sole 24 ore Formazione"(Educational supplement to Sole 24 Ore) – even if some papers reveal a critical approach to some suppositions – the places of strategic reflection multiply: e-LearningExpo (Paris, January 2005) is in its 10th version; the Arab Countries have promoted a specific conference for September 2004; Unesco has just published Integrating ITCs into Education: lessons learned, a manual of good practices collected in Indonesia, Malaysia, Philippine, Singapore, Republic of Korea and Thailand (Unesco, 2004).

Italy must go ahead at different levels: gaining users, producing quality contents, refining representation modalities of these contents, training ad hoc educators ad hoc and integrated teams, reconsidering teaching as a plurality, attracting users from abroad, being therefore competitive. Moreover, for Italy it means, above all at university level, keeping a critical approach to knowledge, typical of Italian academic tradition, which has a competitive connotation in a global society which emphasizes diversity as a value.

At the moment for different sectors of knowledge society (universities, academies, associations, etc.) and of net economy, in a context of an exponential offer made through portals more and more in search of their own niches, it is necessary to establish themselves with their own qualitative identity.

It is not by chance that in websites and portals of the public and private educational agencies, the direct and self referential presentation of e-learning programme (who we are, what we do, etc.) of the past years gives way to a programme/product, framed in an architecture which implies a plurality of information and services, focusing on the aspects of reflection: definition of e-learning and historicization of this field, data banks, unabridged or revised documents.

3. The right figure at the right place

The first and second generations of e-learning were built on Skinner's educational model of stimulus/reply/reinforcement which implied the inflexible system: teacher, tutor, multimedia material, and distance learners. This period is basically over. The requirements of cognitivism and of contructivism, the studies on androgogy and the adult learning motivations have pushed to go beyond the automatism of stimulus/reply and to direct e-learning to self learning in internet, to *cooperative* and *peer learning*, to intermediality.

And it is in this perspective of building a mature knowledge, suitable to one's learning needs and learning styles, that the cognitive dimensions of *knowledge society* and *mind society* are interwoven.

The evaluation of Distance Learning, its quality, has been measured on the *number* of contacts, of accesses, of connections, etc. Today the system has become more complex. And besides, an analysis of peer reviewed articles, since the mid 1990s to now, has shown how the discussion on the topic has moved, in particular after 2000, from problems to the broad band, with the objective of presenting and discussing practical cases of application (Nacamulli, 2003). There are many *best practices* which, in the evolution from the traditional to virtual classroom, have implemented complex learning systems, which use, in flexibility and synergy, all the potentialities of ITC, but are able to integrate in the digital system also the communicative codes of other modalities of *learnativity.* It is not a chance that the key words of this third phase of Distance Learning are *interface* and interaction.

These functions have set up a multitude of new professions – and this is the indicator which gives meaning to the dynamic quality of e-learning as social phenomenon – a ferment of different professional roles, of projects, of didactics, of research, of system, of support, in which the dialectic relationship between the specialized explicit knowledge and the implicit culture of all participants – including learners – is the real precondition of the effective network action; in this dialectic relationship, the *old-time* approaches based on reflection seem to be able to discuss about the professional competences and about the job opinions.

The environments of ASP-SSGRR, a company belonging to Learning Services of Telecom group, and their representative Filippo La Noce, consider as the only valid approach for the future learning the optimization of solid *cultural* figures. In a context of net-economy in constant transformation "the companies tend more and more to use people with the solid liberal education background, thus using highly flexible cultural models" (La Noce, 2002). According to La Noce, in a future view of the society, in a period of *multimedia Renaissance* which preserves the awareness of the historical identity of learning/teaching, the *competitive advantage* can be achieved only by a coming back into *fashion* of the liberal education. "The PC will change its role: from a limited communicator of knowledge to a stimulating element of *knowing how to do* and *knowing how to be*, from the *text editor*

to the *manager of flows of communication*. Rather than multi medial, the desk positions will become *meta-medial*, able to generate books and instruments for exercises, to show films, to put students in contact, similar to telephone contact...".

La Noce's optimism is contrasted by Pier Cesare Rivoltella's position. He is worried that the excessive segmentation of phases and consequently of professional figures can recreate an assembly line rather than a collaborative network. During a recent study seminar in Macerata, 1-2 April 2004, while reflecting on different aspects of *E-learning: education, models, proposals* and in particular on the figures of *teacher, tutor, and mentor* (http://www.unimc.it/elonference/lucidi/pcr/tutor.ppt), Mr. Rivoltella asks questions about critical elements – the disarticulation – which the teaching specialization involves in the different planning phases of an e-learning course. His questions are in particular about the macro level of the organization: " Do the disarticulation and specialization of functions and tasks bring about a return to Taylor or do they satisfy specific needs? Are we facing a phenomenon specific to e-learning or a process which concerns the educational professions in general? What actions should be carried out, on the level of systems and institutions, in order to define the new professional profiles and redefine the old ones?"

As a matter of fact, the problem of defining the *necessary* specification of new ad hoc figures and the problem of putting hybrid figures with a broader cultural, liberal education into e-learning communities, has to placed into a wider context of the post modern crisis of professions. The e-learning educator represents a concise label within the *teaching profession*, a complex figure which has more roles and functions; his/her *composition* concerns, according to Rivoltella, "different ways of being a mentor, a tutor, a teacher"; his/her identity depends on the context in which he/she follows the course and on the target to achieve. Therefore, also for the on-line educator we can talk about the *liquid modernity* (Bauman, 2002). He/she is surely an overexposed figure, which suggests useful reflections within the professional figures of e-learning. He/she is surely a contaminated figure who takes from the traditional didactics the idea of *teaching staff* or the team of experts. In this figure more than in any other are clearly evident contradictions and uncertainties. Sometimes, in spite of principles clearly stated about the constructive didactics which emphasize, obviously, the cooperative dimension of the network learning, the teacher is placed in a dominating transversal position, which does not correspond to the operative integration of the actors belonging to different phases. For instance the model presented by Patrizia Ghislandi at the 2nd e-Learning Summit defines a teacher "not any longer an instructor (supplying the contents) but a facilitator (facilitates learning)"; he/she gathers several functions, including the technical ones: "he/she is in charge of syllabus; prepares and structures the contents; chooses the didactic strategies; chooses multimedia formats; designs the website; coordinates the e-tutors; sets the assessment criteria and modalities…". The e- tutor is a mediator for the administrative, emotional, and motivational operativeness (Ghislandi, 2004). It is evident that there must be a clear definition of the relationships between the *teaching* and the planning and production phases. And it is taken for granted that the consideration of the target determines the adjustment of different phases.

The company and the university, for instance, when adopting an e-learning modality have different objectives. The former wants to achieve in the shortest time a competitive advantage to reinvest both into a new management the inner resources and onto the market. The latter has always been the repository of knowledge and of know how, offering contents. In the former case the tutor is absolutely a *facilitator*- perhaps a trite term; for the latter case, where teaching is research oriented, the tutor promotes the in-depth study of the context and of the topic. The company needs a maieutic-managerial approach (Benardon *et al.*, 2004) and uses figures like the *coach* and the *counsellor* to help clients to achieve their objectives and to facilitate solutions. For instance, the figure, in general not sufficiently promoted, of documentary and on-line research coordinator has a different importance in the company from that of the university; he/she knows the contents, is able to address, to classify and to represent these contents (Calvani-Rotta, 2000). The same concerns the figure of *author*. "the author has always been a secondary figure in the educational sector – says Penge. This gap is even wider considering that the role of a distance course author does not correspond to the author of a traditional didactic object". (Penge, 2004). The company normally buys the contents; the university buys only the standard and basic contents, courses of English and IT. In the traditional teaching, the teacher would

produce contents in readable formats (lecture notes, essays, etc). “In the digital era – says Penge – the author is not only a creator of original contents, but is above all an organizer of contexts in which the contents can be used to achieve a specific aim. We often talk about the *instructional design* to refer to the overall didactic planning, which is requested because of the lack of traditional conditions …we can think that the role of the author may be subdivided into three sub-roles: the text *editor*, who asks the contents to be provided by an *expert of the topic* and offers these texts to the course *designer* who puts them in sequence and integrates them with other instruments offered by the platform”.

As a matter of fact, even if the e-learning is in a mature phase of performance, the continuous multiplying of professional figures (Eletti, 2002) and modifications of their names indicate that this area still needs to reach a certain level of stability. A realistic analysis of the e-learning professions must be based on case studies and best practices rather than on comparison of the standardized names of professions.

4. The Model of Università telematica “Guglielmo Marconi”

The Università Telematica Guglielmo Marconi, recently recognized with DM 1st March 2004 (G.U. n. 65 of 18 March 2004) in accordance with the decree Stanca-Moratti April 2003, is one of the models which can be examined in order to understand better how the e-learning professional figures evolve and also to understand the competence they need to have.

The Università Guglielmo Marconi represents, an Italian model of the Open University directly projected towards the future and ready to accept the future educational challenge. It is however, deeply rooted in the Italian tradition of scientific rigour and thoroughness which characterizes the university education and gives it a specific connotation as compared to other educational institutions: a university able to satisfy concretely new needs of the job market, safeguarding at the same time the fundamental values (freedom and autonomy, reference to a formalized knowledge, scientific competence) which characterize it – values which guarantee a teaching based on the research and an education centred on the curricula able to satisfy the cognitive needs of the individuals within a perspective of life long learning (Briganti, 2003).

This way of teaching wants to give an organizational answer to a deep social change: the democratization of the higher culture which was reserved before to few privileged individuals. Besides, the rapid cultural, scientific, and technological evolution of the global society which breaks down the barriers of time and space makes the acquired knowledge quickly obsolete and modifies the perception of learning needs, making the single individuals protagonists aware of their life-long learning path. The Marconi university contributes to the training and education of new professional figures to be placed on the more and more demanding job market and guarantees at the same time processes of qualification and retraining of people already working or in a phase of professional reconversion.

It is precisely for its specific features that the university has adopted an organizational and productive system based on the subdivision of roles and competences necessary for any activated process. However this system considers the needs of flexibility of a dynamic structure which does not want to become bureaucratic and therefore has a concrete competitive advantage in the world of knowledge.

The *liquidity* of competences does not turn into overlapping and doubling of roles but follows, within the *classes* of competences clearly defined, a fluidity which accelerates the productive processes and contributes to a harmonic growth of the structure and resources which belong to it.

All the values and objectives which characterize this model determine and affect the configuration of the organizational structure and the relationships between the sectors which belong to it: academic figures for teaching and research, technicians and administrative staff for the supplementary and supporting services; ruling bodies for the supervision and determination of strategic choices.

The flexible and dynamic structure represents the fundamental features of the Open University model launched by the Università Marconi, according to the principles of organization by process in which the relationships among different components are based on the working of interfunctional teams – and therefore on cooperation, on sharing of knowledge, on building a concrete work community, by refusing isolation, individualism and collective procedures typical of the participation which is overformalized (Briganti, 2003). The ruling bodies are established and designed according to a model of autonomy-interdependence between the top management, given to the managers expert in direction and supervision and academic leadership for the planning and implementation of research, elaboration of curricula and learning paths. The moment of the didactic decision and planning is given to a team of teachers, experts in different subjects. This moment is also an occasion of meta reflection and research based on the qualitative approach which relies on constant discussion and exchange of ideas. This approach solves also, even if only partially, the ambiguity of the term management. We prefer to use the term direction for meta cognitive direction and the term management as meta functional management of knowledge.

In this productive management system the flows of competence are outlined according to functional specialization which does include operative transversality sufficiently flexible for an organizational context recently established and with innovating structure and cognitive aim if compared to similar operative structures. This shows the forming of new professions linked to the classic research of knowing to be by John Dewey (knowing, knowing to do, knowing to be) but with a new conception. The requested competences get modified in time and are codified gradually as processes are structured and become concrete in daily acts of procedural logic. This has determined on the one side the first conscious reaction to the birth of new professional figures and on the other has imposed a critical reconsideration of the existing professions involved in a new reorganization of production and communication models rather than in transmission of knowledge.

The models of distance planning, design, production and delivery of the first, second and third generation have contributed to the birth of new professional profiles, which, even if not strictly limited to their connotations are on the way towards a high specialization by sectors and functions.

5. E-learning processes and products: from phases to services

The institutional role of university, i.e. the research and transmission of knowledge, acquires with the realization of e-learning processes/products a new energy and social effectiveness because it already includes in itself, i.e. in its feature of cooperative communication, the explicit and implicit knowledge and competences already present in learners. This means that the traditional linear system of elaboration, mediation and transmission of knowledge is modified into a circularity in which the students themselves produce knowledge which is put into circulation in the learning process which continuously produces knowledge.

Phases and processes	Roles and professions	Services and competences
Knowledge Scientist	Professor/magister	Scientific experts who define who the learning process takes place and on what it is based (Didactic curricula, knowledge organization and planning)
Decision And Planning	Chief learning officer	Expert in didactic short and long term didactic planning
	Training manager	Expert in short and long term learning
	Learning administrator	Expert in process planning both from the technical functional viewpoint and from the didactic operative point of view
	Information scientist	Expert in analysis and planning of information flow
	Programme Manager	Expert in planning the management of R&D programmes/activities
	Project Manager	Expert in direct management of projects and of research activities

Project planning	Instructional designer	Expert in creating the technical didactic structure to represent the knowledge
	Curricula planner - Knowledge designer - Content communicator	Expert in curricula planning and definition: - organization of knowledge and cognitive representation - organization and elaboration of contents
	Multimedia project manager	Expert in planning the modalities of scientific representation of different delivery systems
	Art director	Expert in identifying visual graphic modalities useful for an effective communication
Production	Production manager	Expert in project planning and implementation of production flows
	Project manager	Expert in managing single production flows connected to specific projects
	Content developer	Expert in planning the editing of specific contents for target groups
	Information officer	Expert in managing the document flows and internal communication processes for the reproduction and reuse of products and processes
	Storyboarder	Expert in activities of planned (written) link between knowledge and the identified multimedia representation together with the relative audio visual support systems
	Author/Editor	Expert in editing texts which originate from subject knowledge and become learning knowledge elaborated for specific aims and targets
	Graphic designer	Expert in representing knowledge through a symbolic approach based on images and graphic representations
	Media developer	Expert in development and spreading of different media for knowledge
	Systems engineer	Expert in networks and interconnection systems LAN and WAN
	Software developers	Expert in developing software and innovating multimedia communication modalities
Distribution	Lms and Scrom expert	Expert in standardized production systems at international level and layout processes/modalities
	Virtual infrastructure expert	Expert in virtual dialogue and communication systems , one-to-one, one-to-many, many-to-many
	Reporter	Expert in systems of decoding, cataloguing and synthesis systems of didactic technical outputs for indivi duals or for filtered groups
	Virtual instructor	Expert in systems of virtual codification and 3D representations
	Tutor	Expert in didactic assistance to the student in the general learning process
	Mentor	Expert in scientific assistance and in depth didactic modality supporting a personalized learning process and maieutic research.
Validation	Quality tester	Expert in systems of quality analysis of processes and products
	Process analyst	Expert in process analysis and in data flow which activate processes and come from them
	Project analyst	Expert in analysis of production flow of single projects
Evaluation	Learning evaluator	Expert in systems which evaluate learning and modalities of knowledge transmission and acquisition
	Usability manager	Expert in facilitation and access systems

Application	Delivery manager Internet delivery manager DTT delivery manager	Expert in processes of knowledge delivery by web and digital terrestrial TV
Guidance/counseling and motivational support	Expert in motivational support Expert in systems of study guidance and counseling	Expert in processes of psychological assistance to guide and support students in their choices Expert in study guidance and counseling which consider natural bents shown at school age

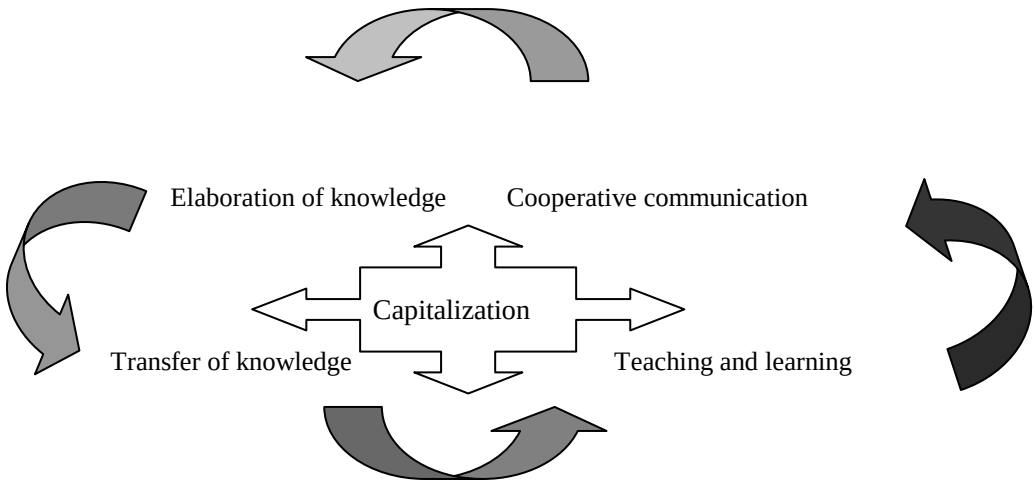
Flow of the ideal phases of an e-learning process/product: different phases, professions, support services and necessary competences.

In the traditional flow of knowledge transmission

teaching → *elaboration* → *trasfer* → *learning* → *society,*

the linear process is clear; in it the society is the final stage of different organizational phases. Teaching/learning has as its aim the improving of society as system. The aim was to improve the relationship between society and school present in Dewey's pragmatic philosophy. The society, in the end, is the final recipient and last beneficiary; however it did not play a direct and active role in the re-definition of cognitive inputs and of process implementation. The individual in the linear process of knowledge takes advantage personally of the melioristic process, but is fundamentally foreign to the process of building knowledge in terms of cooperation with teaching.

In the new flow of knowledge transmission teaching/learning, thanks to new technologies, is not the initial link of the cognitive chain, and the society is not the final recipient of the process



The competitive advantage does not lie in the improved evolutionary process of learning, but in the collective capitalization of knowledge. In it the central role is played by the individual who rediscovers the cooperative phase of the social interaction and effectiveness of collective intelligence. (Lévy, 1996). The communication becomes cooperative because it is the expression of plural actions in which the implicit knowledge experiences become explicit.

It is clear at this stage that the complexity of new processes/ systems of production and transmission of knowledge "in team" generates itself "a company" of production of knowledge which guarantees, far from commercialization, the unity of approaches safeguarding the combination complexity-liquidity in a constructive way. The tendential fragmentation of knowledge, generated by the complexity of the knowledge itself, which grows exponentially, is encompassed again and brought inside a unitary circular system.

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PROFILE – A EUROPEAN CURRICULUM FOR HEADMASTERS

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Abstract

This paper wants to give a short description of the implementation of a European Project (Comenius 2.1.) whose main goal was to build up a common curriculum for headmasters. The partners in the project are institutions from Austria, Germany Check Republic, Switzerland and Portugal.

Introduction

With the role of schools in society changing, quality development issues and demands for school autonomy are finding new trends in education. This is leading to changes in the demands faced by the management of schools; these demands are necessitating the systematic use of research findings in school management practice and in quality development at the level of the school.

Until now, school research findings have hardly been integrated into the work of schools and ongoing training institutions, despite the fact that almost all school employees are academically trained; the findings tend to remain at the level of academic institutions and education authorities or become part of the career plans of individual teachers.

Schools and schools research are two fields that, in terms of a joint knowledge basis for action, are relatively separate. There is hardly any systematic communication between the two fields. This situation has long been known as a theory and practice problem. The consequence is that the systematic transfer of knowledge and the planned use of knowledge in practical school management are still in their infancy. Teachers and headmasters mostly believe that research has no practical relevance. Conversely, schools researchers have difficulty in communicating their findings as being significant for “practical people”.

It will therefore be crucial for school managers to reflect on such research findings in terms of their significance for their own actions, i.e. to ascertain the position of their own professionalism within the trends in the European framework. To do this, headmasters will have to find adequate information sources and be offered qualification components. From the point of view of ongoing training didactics, mediation stages between the traditionally separate segments will have to be conceived - primarily for school managers and those who provide them with further training - if the developments in schools research are not to be uncoupled from the schools.

The basic assumption was that the professional development of headmasters requires a set of structured learning opportunities, the implementation of what was learned in projects at the workplace, cooperative reflection on the implementation and targeted support from information and consulting systems. The targeted interplay of the elements is the prerequisite for sustained learning impact and changes in management practice. The structure takes the form of a dual cycle, firstly for the target group of trainers and then for the target group of headmasters. This dual run-through is used for testing the whole concept, qualifying a group of trainers who will then be involved in the qualification and support of headmasters, and thus guaranteeing the further dissemination of the programmed.

Objectives

The goal of the project is to develop and test an ongoing training curriculum for the use of schools research findings, so that the current modernization demands on school management are tackled efficiently.

The curriculum is a package consisting of a set of four ongoing training modules for trainers and for headmasters, in which the utilization of relevant schools research findings is trained, reflected upon and tested in model form for the management of schools. The four modules focus on aspects that, according to schools research and practical experience, are particularly challenging: 1) supporting school development processes; 2) supporting school personnel development; 3) using external data from the system monitoring field; 4) school management functions in the development of schools and teaching.

In all of the modules, research findings that have practical relevance are processed, integrated into professional learning arrangements and thus made useful in practice for the participants. Particular consideration is given to gender dimensions of school management activities.

Outputs

The outputs of the project are:

- one set of continuing education modules for trainers and headmasters on the following themes: 1) supporting school development processes, 2) supporting school personnel development, 3) using external data from the system monitoring field, 4) school management function in the development of schools and teaching; a manual for trainers (recommendations and material for the planning and implementation of the professionalisation measure for headmasters, with conceptual introduction, information, template copies, handouts, etc.) and a manual for headmasters (recommendations and material on the organisation of individual learning and the internal implementation of development processes in schools; with conceptual introduction, information, template copies, handouts, etc.) will be drawn up for these modules;
- one Internet-supported information offering (Web site) for trainers and headmasters that provides an overview and substantiated selections of relevant addressee-related research findings on the four aforementioned ongoing training modules and facilitates the domestic and transnational networking of information about projects, institutions, publications, etc.;
- one database adapted to fit the needs of addressees, featuring relevant research findings, addresses, contacts, etc. that can be accessed via the Web site;
- one system, accessible via the Web site, for e-learning for headmasters in respect of the four aforementioned modules;
- one evaluation report on the results and impact of the training sessions and on the use of the Internet-supported material.

The Web site featuring a database and e-learning is designed to support the addressees; as a tool, it is an integral component of the ongoing training concept.

The final product versions are all produced in DE, EN, FR, PO and CZ.

For more information please see: http://profile.ipcb.pt

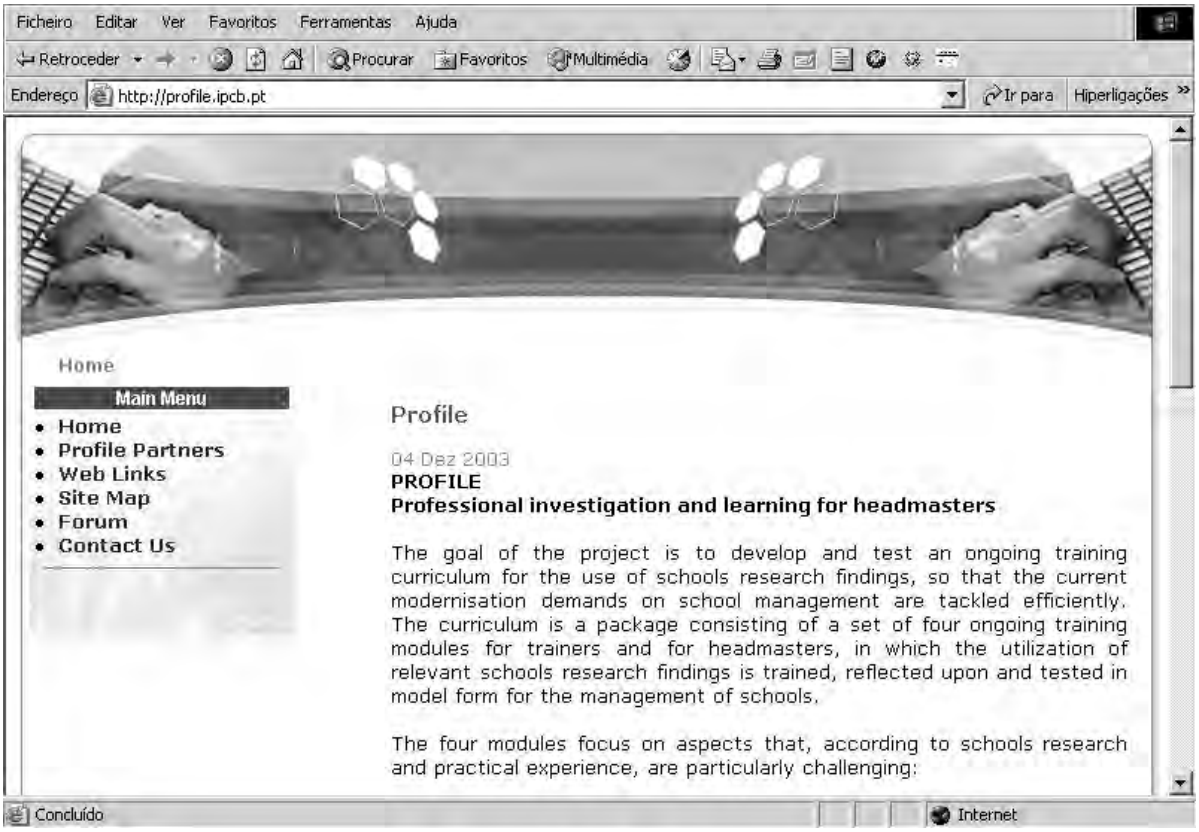

Figure 1. Screenshot of the project homepage

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