
ONLINE PEDAGOGY – INNOVATIVE TEACHING AND LERNING STRATEGIES IN ICT-ENVIROMENTS

BACKGROUND PAPER OF THE CEVU WORKGROUP ONLINE PEDAGOGY

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A. INTRODUCTION: BACKGROUND OF THE PAPER

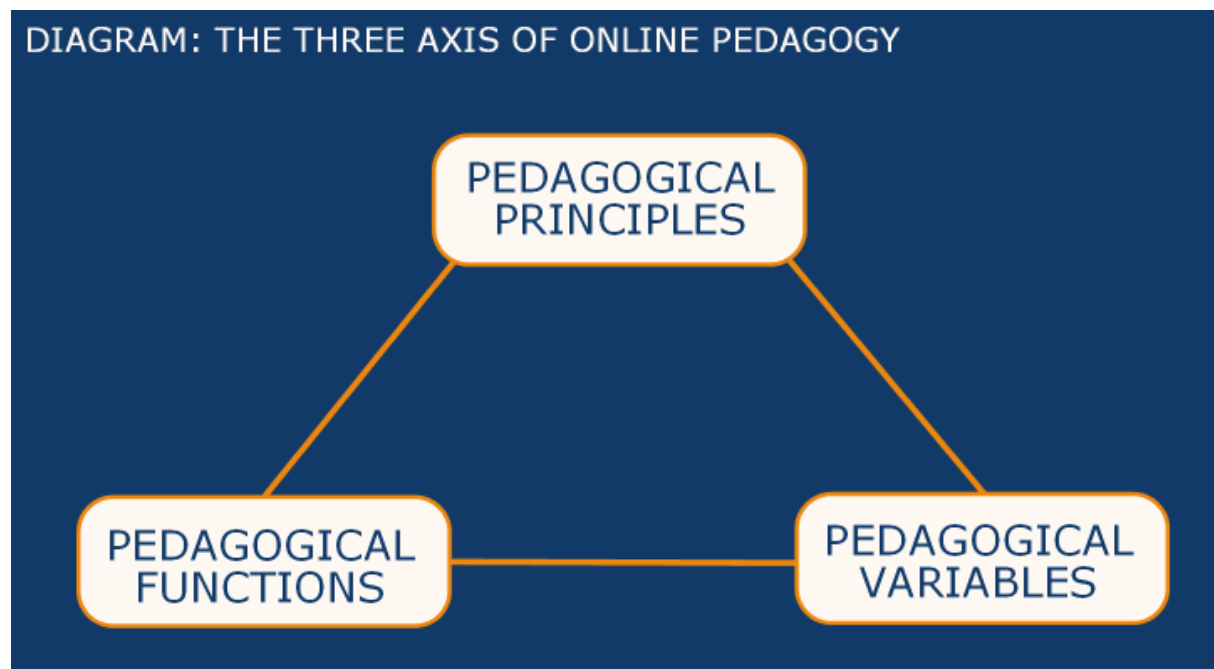
The workgroup "online pedagogy for virtual learning environments" is part of the research project *collaborative European Virtual University*. The *cevu* - project is funded by the European Commission with the objective to develop concepts and frameworks for the realisation of a common virtual learning environment based on the collaboration between various european universities. One main idea of *cevu* is to examine the whole process of integration of ICT into higher education with the focus of understanding the organisational changes in the participating universities.

Organizational change is more or less connected with change in teaching and learning. The task of the working group concerning *online pedagogy* was to analyse the process of change and its underlying educational views. When we compared the different approaches of the universities that were involved as partners of the workgroup in the *cevu-project* we found a heterogeneous puzzle of pedagogical models and innovation strategies. When we tried to combine the different elements of this puzzle into a coherent picture we neither found a consistent theory nor a common model, which could lead to a full understanding of the various approaches in online pedagogy. Nevertheless it seems possible to outline a frame that arranges the diversity of observed practises into a certain order.

On the basis of this background we suggest to distinguish three dimensions in the field of online pedagogy. We assume that the frame of three dimensions enables an appropriate overview, allows a general orientation and gives hints for practice to those university teachers who are engaged in distance or blended teaching and learning. The three dimensions we created in this context, are

- I. PEDAGOGICAL PRINCIPLES
- II. PEDAGOGICAL FUNCTIONS
- III. PEDAGOGICAL VARIABLES

for virtual learning environments.



We assume that it is not adequate to force the partaking universities to follow a particular educational model. We have to recognise that different universities and within those different faculties or even different projects build up their practice on the basis of distinct considerations.

The approach of the *pedagogical principles* outlines on a macro-level the general trends that can be observed in the field of online pedagogy with respect to the integration of ICT into higher education and the realisation of virtual learning environments. The first part of the paper thus integrates the different facets of the online pedagogy into an enclosing picture by summing up the different developments strings into ten thesis of educational beliefs.

The approach of *pedagogical functions* develops a meso-level in online pedagogy based on the learning situation and contexts that can be defined in the higher education and have to be integrated into the construction of virtual learning environments. The second part of the paper analyses the pedagogical requirements for the use of ICT in teaching and learning from the point of view of various pedagogical functions such as authoring, moderation, working with tools and so on.

Last but not least the approach of *pedagogical variables* adds on a micro-level all the concrete pedagogical options that can be used to design and structure education in a virtual university. The pedagogical variables in this context are understood as the discrete structure elements that – in its sum define the form and the options to teach and to learn in virtual learning environments.

B. REGARDS ON THE CONCEPTIONAL BACKGROUND AND FRAMEWORK OF ONLINE PEDAGOGY

1. PRINCIPLES IN VIRTUAL EG BLENDED LEARNING ENVIROMENTS

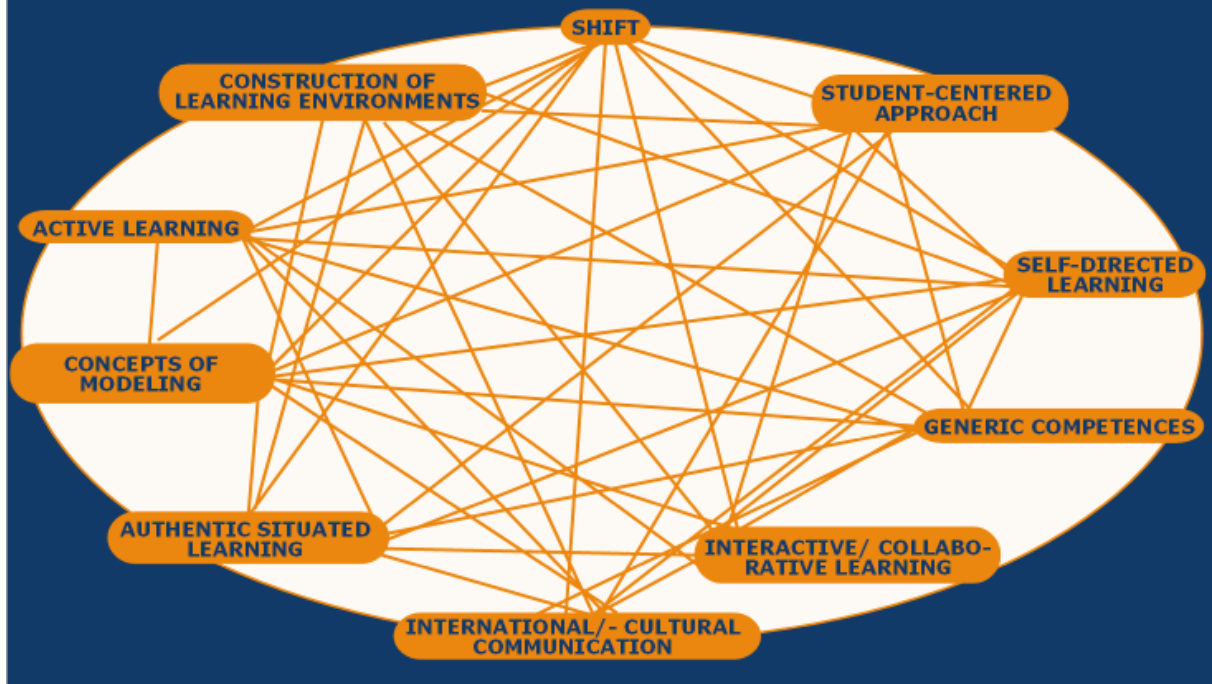
Preface

The current developments within the field of online pedagogy and the questions concerning net-based teaching and learning seen from an educational perspective are adding in the european area to a fragmented and diverse picture. On the of a basis of here presented analysis we do not dispose of a survey with empirical foundations adequate enough to be truly representative. Nonetheless it may be stated that the universities belonging to the network of the cevru-project can be counted to the top-level universities in Europe. Indeed - and at this point the analysis can offer already more precise and validated conclusions in the cooperation - within the framework of the network exists a remarkable range of variations and non-simultaneity of the developments both between the and within the specific universities respectively their substructures as faculties, departments or other institutions.

This heterogeniety does not only exist in the applied technologies and their embedment into different organisational structures. It also applies for the more or less implicit respecticely explicite educational conceptions. Abstaining from a few exceptions there cannot be recognised a common pattern, that the ensemble of universities in the network would follow uniform, coherent educational theories, models or concepts. In fact individual universities - in particular when their founding history like the university of Aalborg implicates interdisciplinary educational concepts - with distinctive educational concepts can be named. In most universities however persist between particular sectors, and also within these diverse projects, partially considerable differences.

Adding to the whole picture there nonetheless still can be perceived a significant asset of consents. These consents do not refer to educational approaches which have been prooved according to theoretical and empirical premises. The consents are rather perceived in a basic asset of educational beliefs, so to say basic pedagogical principles that offer in practice an understanding and insofar serve as a solid fundament for intensifying the cooperation. These educational principles can be added to ten thesis:

DIAGRAM: THE TEN PEDAGOGICAL PRINCIPLES IN VIRTUAL LEARNING ENVIRONMENTS



1.1. THE SHIFT FROM TEACHING TO LEARNING

The current online pedagogy is following up the globally desirable trend of a "shift from teaching to learning". Simultaneously the online pedagogy takes on a key position in the fundamental institutional change of the higher education sector. The ICT changes in an increasing degree the roles and relationships of learners and teachers by interfering and changing their interactions. The process of student's learning arrives at the focus of attention. The (traditional) tasks of an effective presentation, that is the task to transport learning contents into the presence in order to make them perceivable and learnable, will still persist. But in a virtual learning room they constitute just one variable (amongst others). In contrast the learner's activities are moving very distinctively into the foreground. Thus it is not sufficient - and all participants in the cevu-network agree on that argument - just to put the teaching material into the internet. Online pedagogy, as it is understood here, mainly focuses on the activities of the learners and observes the teachings primarily from the point of view of support.

1.2. STUDENT - CENTERED APPROACH

Thus the student-centered approach can be seen as the common pedagogical frame for the cooperation. This approach is based on the deepened understanding of student's learning. The learning process of the student is not just understood as a procedure in a black box, in which only the input of presented knowledge and the output of the known is observed, that for example just has to be reproduced in an exam. In a mainly divided constructivist perspective the student's (collegiate) learning is seen rather as an active, individual and socio-cultural process that is dealing with the construction of cognition and competences. The students create in the process their own structure of knowledge of the studied discipline and they develop acting opportunities that enable them to treat knowledge in a competent manner. In the context of online pedagogy the teaching aspires to support the students in this process. In comparison to the teacher-centered pedagogy the focus is shifting to the observation of implications for learning, the orientation to the process of learning and the feedback activities of the teachers regarding the progress in learning.

1.3. CONSTRUCTION OF LEARNING ENVIRONMENTS AND LEARNING ADVICE

In the student-centered approach the emphasis is moving from the traditional instructional-centered teaching towards the support of learning. The construction of learning environments and learning

advice is evolving as one central task of the teachers. In the setting of pedagogical interaction respective communication the teachers are less occupied with the procurement of learning materia. In fact the learning materia is integrated within the content management in a pedagogical design and is mainly available as virtual information in the net. The construction of a media-rich learning community enables the students to access the knowledge and the tools for the organising, elaborating and critical-proving, reproductive acquisition of codified knowledge assets. With the precise selection and acquisition of knowledge the interaction between teachers and learners occurs less in form of instruction, but rather as interaction in which the students adopt the role of counsel-seekers and the teaches the role of counsel-givers.

1.4 ACTIVE LEARNING AND LEARNING STRATEGIES

The students acquire an active role in above described learning arrangements. To be able to fulfill this role, they do not only have to cope with the added responsibility for their learning, but also they have to dispose of suitable learning strategies. This applies to the cognitive exposure with knowledge (organisation, elaboration, critical examination and retrieval) as well as to the meta-cognitive strategies of planning, controlling and regulating the own learning processes and also the application of internal motivational and external supportive resources. In particular in relation to the knowledge management the virtual environment poses increased requirements (to the learners). But even apart from this facet the learning strategies within ICT-conditions face particular molding necessities reacting to the special characteristics of virtual learning environments. The objective of online pedagogy is to place a adequate support at the disposal. The participants of the cevu-network agree on that point that particular attention has to be paid to the objectives of scientific learning. Thus in the area of learning strategies the so-called deep approach is favored. This approach rates the understanding of theories and coherences higher than the sheer reproduction of facts.

1.5. SELF-ORGANISED AND SELF-DIRECTED LEARNING

The students can only adopt responsibility for their own learning process, if they are in the position to organise and steer their learning process themselves. They can only then cope with this demand if they are able to use the prepared learning environment accordingly to their individual learning pre-requisites or to adapt the environment accordingly to their needs (self-organised) and to make independent decisions regarding their learning ways (self-directed). This scenario implies a disposition settled in the motivational pre-conditions to do, what you are able to do and to want to do this also (volition).

1.6. GENERIC COMPETENCES

The above mentioned *Shift from teaching to learning* has the objective to focus on the learning outcomes. From this point of view it seems not sufficient to only foster the acquisition of knowledge. It is certain that knowledge acquisition is now a main task of studying and will be so in the future. Scientific knowledge is the basis of subject-oriented competences. But in relation to these kind of competences the acquisition of the so called generic competence becomes more and more important. Generic competences enable the academics to behave in social contexts in an efficient and responsible manner (social competences) to cultivate self-awareness and personal enhancement (personal competences) and to make appropriate use of scientific knowledge in the whole field of practice (methodological competences). *Online pedagogy* is committed to combine the development of both types of competences, subject-oriented and generic competences into complex competences of the purpose of acting (Handlungskompetenzen).

1.7. INTERACTIVE, COOPERATIVE AND COLLABORATIVE LEARNING

In fact learning always will be bound to the individual learner. Therefore it is of high value that learning in general is realised in (social) connections. Thus learning not only is intensified. At the same time

learning opens up a social dimension in which evolve social competences to act. These competences are essential for scientific work and teamwork. In media-enabled placement the interactive and collaborative learning faces particular demands, whose handling needs special competences. Indeed there is a consensus in the *cevu* network, that the interactive, cooperative and collaborative aspects of learning deserve the highest degree of attention. In the long run cooperative and collaborative learning may lead to develop learning communities

1.8. INTERNATIONAL AND INTERCULTURAL COMMUNICATION

The global structure of the world wide web not only enables, but even demands to realize interactive and collaborative learning in an international range. At the same time international communication implies and fosters language competences. That includes not only the communicative abilities. In addition international communication is as well a tool for understanding as also an instrument to access new horizons of understanding, in which the personal knowledge can be integrated into the globalised scientific culture and leads to a better multicultural understanding.

1.9. AUTHENTIC SITUATED LEARNING

In virtual rooms it is especially the abstraction, the extraction of the objects of learning out of their traditional contexts that demands their media-based recontextualisation. Virtual learning reproduces at the level of a second reality the authenticity of situative learning. The online pedagogy disposes of an abundant repertoire of simulative methods, which enable the observation and manipulation of a multitude of correlations, that keep hidden in real time and real environments. The disadvantages of inadequate real encounters stands vis-à-vis to the advantages of an intensive reflection with pedagogical reconstructions.

1.10. CONCEPTS OF MODELING

Finally the global trend tends to favor the learning in virtual learning environments, that not only provides pre-determined knowledge structures and contents, but exposes them as problems, case studies or research questions. Adequate for these learning arrangements are pedagogical concepts of a problem-oriented, case-oriented or (guided) enquiry-oriented learning. The participants of the *cevu*-network agree that the research-adequate learning starts with these pedagogical approaches, which accesses the learning objects on the basis of theories and methods of studied science.

The different principles can be more or less combined to characterize teaching and learning in the online mode. As every teaching activity it has to fulfill particular functions. In online teaching the particular conditions of the ICT – environment it is necessary to consider the following functions.

II. PEDAGOGICAL FUNCTIONS FOR VIRTUAL LEARNING ENVIRONMENTS

2.1. EDUCATIONAL DESIGN AND MODELLING

If we follow the above stated educational beliefs as leading principles it is not useful to construct pedagogical models as pre-requisites for the design of learning environments as e.g. learning platforms, learning systems, teaching and learning arrangements. Facing the fact that the whole spectrum of media-based options for teaching and learning arrangements is currently still in a state of development and pledges to offer a high degree of diversity, the claim of a "design-oriented pedagogy for media" is too dependent on premises respective is doomed to fail when it is confronting the reality of media, that is profoundly based on a division of labor and organized in an unequal and non-simultaneous way.

The partners of the *cevu*-network assume that the nowadays internationally favored solution, to correlate the heterogeneous and distributed databases with the help of metadata, is not a sufficient realisation for the above stated premises. The standardisation of metadata with variable granulation and pedagogical diversity do not necessarily lead to coherent pedagogical constructions. Pedagogical modeling or meta-modeling of a given provenience is incomplete, too secluded or idiosyncratic, as Rolf Schulmeister from the University of Hamburg precisely stated in a recent survey. The way he is drawing by the use of pedagogical scenarios with taxonomies and scalabilities of interactivity, strategies of visualisation and tools only partly overcomes the hence arising dilemmata. They are only a subset of the conceivable scenarios and do not represent the diversity of course types.

2.2. PEDAGOGICAL FUNCTIONS

Thus we propose a pedagogy aligned pragmatically to the pedagogical functions, that are organised within the perspective of educational beliefs around topics like content-, process- and media-based scientific learning and studying. The world of technological and media-based rooms is seen as a variable design of these technological options and embedded in a context of configured knowledge management, cognition and reflection, communication and action.

Indeed this procedure demands a solid infrastructural supply with plurality of technique and media. Solitary and system-embedded, excellent solutions are also urgently needed. This demands a pedagogy of open scenarios and adequate media-based blended-learning environments, in which courses of present and net-based teaching and learning in higher education coexist and add to each other.

DIAGRAM: PEDAGOGICAL FUNCTIONS FOR VIRTUAL LEARNING ENVIRONMENTS

PEDAGOGICAL FUNCTIONS

FUNCTION1: AUTHORING AND REPRESENTATION

FUNCTION2: MODERATION AND FACILITATION

FUNCTION3: WORKING WITH TOOLS AND COGNITIVE TOOLS

FUNCTION4: SUPPORTING LEARNING STRATEGIES

FUNCTION5: EVALUATION, SELF-STEERING, CONTROL AND SELF-CONTROL

FUNCTION6: ORIENTATION ON LEARNING COMMUNITIES

2.2.1. FUNCTION 1 : AUTHORING AND REPRESENTATION

(orientation on content and process, creating learning arrangements (problem-based learning, research-oriented learning, scenario studies, case studies, experimental environments), designing interactivity (reception, multiple actions, modification, manipulation, construction))

The pedagogical function of the selection and presentation of contents needs to be conform with the system and the standards of scientific declaration systems. The selection of the content nonetheless is more oriented towards learning than referring solely to the subject and has to be conceptualised respecting aspects of designing interactivity, reception, multiple actions, modification, manipulation and construction. They have to be configured within a learning environment, which takes into account authentic and reality-oriented contexts, situates learning in correlations of acting and allows problem-based learning procedures (creating learning arrangements, problem-based learning, research-oriented

learning, scenario studies, case studies, experimental environments). They also should be multi-perspective (learn-logic, structure-logic, problem-logic and so on), allow learn-motivated access, permit loops, enable the manipulation of parameters, the adaptation towards personal learning styles and inventive learning methods and support self-steering and self-organisation. The presentation should offer a variety of interactive manipulations and be organised in a self-adaptive and learner-adaptive way.

2.2.2 FUNCTION 2: MODERATION AND FACILITATION

(allocating rolls, moderating, coaching, facilitation of reading, writing, understanding, presenting, warming-up, motivation, elaboration, examination etc., self-organization, communication, collaboration)

Pedagogical action aims at interrelating teaching and learning. On the one hand teaching in this sense serves the purpose to enable respective facilitate learning. If it is not just the case of individual learning - which are common in learning contexts of higher education - but the interaction within a learning group and with a teachers is meant, the teaching defines the modus of interaction, insofar as the interaction takes place within the learning process. In this sense facilitation and moderation constitute basic pedagogical functions that have to be realised in online teaching respective blended learning exactly like in a face-to-face situation.

The peculiarity in online teaching respective blended learning is the mediation of these functions by means of ICT. For this reason various options of communication, that have been practised in face-to-face situations, do not apply here. In particular this is true for the whole richness of non-verbal, gestic and mimic aspects of interaction characterising the "normal" communication in a considerable manner. These means of understanding are replaced in media-based interactions by explicit forms of communication. At the same time the methods used for moderation and facilitation in face-to-face situations can be transferred into media-based interaction and be adapted respective modified within these virtual learning environments.

From the point of view of pedagogical functions these aspects result in the requirement to explicate moderation and facilitation within explicit acts of talking. This refers to the whole variation range of learning actions such as reading and reproducing, asking, discussing, exploring, constructing, understanding, interpreting and communicating in a discursive manner and so on. In particular this refers also to the way how the participants of a learning group are connected to each other and thus create a collaborative work. The scope of collaboration includes simple forms of organising a list of speakers, the moderation of discussion, the summary, the articulation of tasks as well as micro-pedagogical formats of classes. The whole range of pedagogical options for arranging face-to-face courses (such as working in small groups, change from small groups to plenum, expert hearings, fishbowls and so on) has to be transferred into ICT - environments and to be equipped with new of norms of communication adequate for the media.

2.2.3 FUNCTION 3: WORKING WITH TOOLS AND COGNITIVE TOOLS

(collaborative tools, presentation tools, annotation, modelling, creating text and hyper-text, knowledge management, construction)

ICT environments offer particular media-based qualities that are singular and specific compared to other types of media. They change the handling of knowledge and information, the representation, the perception, the communication and the production of knowledge. In contexts of teaching and learning this development is observed as enrichment of heuristics by means of embroadened techniques of retrieval, program-based solutions for presentation and visualisation, socio-technical systems of knowledge management or collaboration, modeling virtualisation. Next to "small" solutions of manipulative or interactive techniques for explorative learning, support of cooperative learning there arise completely new learning scenarios in the context of automatic man-machine interfaces of learning

and adaptive knowledge management within telematic and virtual environments. Cognitive tools add to and enhance the pedagogical perspectives on the subject of teaching and learning. The ICT - context changes the notion of "tools", "media competence" and "pedagogy".

The diversity of cognitive tools can be arranged in levels of complexity. First of all there can be named tools that support the exploration of learning environments and facilitate the use of media, e.g. functions of awareness which within the learning environment call attention to events. Tools that enable one's own achievements of construction in the net possess already a more complex structure like e.g. tools for authoring or modeling of presentations.

Moreover we have to take tools into consideration that enable the realisation of virtual learning environments and the production of simulations. Also in reference to ICT competences different levels of complexity can be differed. They range from an "easy" use of applications and achievements of construction such as the production of scientific texts, the modeling of processes and so on to autonomous realisations of programs respective modifications of programs.

These cognitive tools and technical competences are arranged preliminary to the pedagogical competences relating to ICT. In a deeper sense they have to be integrated into the pedagogical strategies. These pedagogical strategies range from moderation respective guidance of learning and work processes and the preparation of course concepts like tutorials to pedagogical meta-models. The pedagogical meta-modeling offers tools for the orientation and the arrangement of pedagogical designs, e.g. situated learning, problem-based learning, case-oriented studies and so on.

2.2.4 FUNCTION 4: SUPPORTING LEARNING STRATEGIES

(awareness, annotation, personal adaptation of the interface, learner adaptation, voting, brainstorming, follow your own, exploring, manipulating, experimenting)

Learning strategies achieve a special importance in ICT environments. They are the answers to questions regarding motivation, socialisation, habitus, cognitive and meta-cognitive competences, volitional competence, curiosity and waywardness. Currently ICT favors the visual sense and curtails the human perception with the sensual reduced interface design. Hence elaborate designed interfaces try to reconstruct the perceivable of the interface. The far reaching consequences of this development result in the artificial re-introduction of dimensions of perception. These endeavors have to be taken into account in particular in contexts of teaching and learning and are not sufficiently covered by means of usability, adaptation and customisation.

Examples for pre-requisites that have to be realised include explicit support tools for presence and absence, socially differentiated interrelations, roles and functions, explorative and experimental environments, differentiation of one's own and alien, scales for observation, functions of annotation, summary of content and sequel of manipulations, interactions, interactivity and virtuality, differentiation of levels of reality ranging from "real" to "fictional", "virtual" and so on, data security, security of privacy and the right to secure rooms. The crossroads between media amounts in the context of blended learning to a particular problem. If learning strategies are not appropriately respected within the face-to-face classes, the new environments offer the chance of an integral reconstruction of the learning actions. In addition the problem shows a new facet on the level of ICT environments.

Learn media, cognitive tools and simulation media tend to inscribe curricula, pedagogies and strategies of learning into the programs of ICT. Thus they become implicit qualities of the programs. In contrast it is important to explicitly form the curricula, pedagogy and learning competence and to make them flexible for arrangement and perceivable within the media. As a consequence the democratic legitimization of the construction process of media, the process of reconstruction in the context of teaching and learning and the arrangement in permanence result as new tasks.

2.2.5. FUNCTION 5: EVALUATION, SELF-STEERING, CONTROL AND SELF-CONTROL

(assessment, control and self control organizing feedback, tracking, self controlling by portfolio, last and not least controlling)

The assessment in ICT environment serves mainly two purposes: on the one hand the institutional and administrative steering, control and evaluation qualification processes and on the other hand the steering and evaluation of teaching and learning processes. Regarding the current circumstances it can be observed the extension of the technical and media infrastructure for institutional and administrative tasks, in particular as a consequence of micro-structured modularisation and international competition.

From the perspective of pedagogical functionality the steering and evaluation of teaching and learning processes and the involved actors are at least of the same, if not of higher importance. Here we observe right now significant deficits. There is a reconstruction of the assessment as a steering instrument for the environment of teaching and learning needed. In this context a set of instruments is moving into the focus such as self-observation, self-description, differencited and scaled processes of feedback and tracking of activities, the realisation of minutes and portfolios, symmertic feedback of students regarding feedback, the steering of learning processes and finally motivating assessments of teachers. They are integral part of a scientific qualification process based primarily on self-directed and self-organised processes, that in the sense of a research-based study and learning-based research is edging closer to academic qualification and initiation to the premise of science.

As universal recording machines ICT media are good instruments of assessment. But nonetheless they include a whole range of problems regarding the security of data and privacy. Moreover the attention should focus on program-embedded solutions that support the self-steering with respect to the privacy, room for options and choices, social awareness and distinctive ideas.

2.2.6. FUNCTION 6: ORIENTATION ON LEARNING COMMUNITIES

(collaborative learning supported by hypermedia-environments, changing roles and patterns, symmetric learning behaviour, new relationship between learners as partners, coaching strategies, changing perspectives, ad-hoc relationship and free communities)

The most important and comprehensive innovation supported by hypermedia-environments are collaborative learning scenarios. There is a big chance for changing traditional roles and making and taking new roles. Patterns of behaviour can be changed and new patterns should be set up, that refer to a symmetric teaching and learning behaviour. A new relationship between learners makes them partners first of all and allow support for learning strategies, which are best described by coaching strategies and coaching scenarios. Changing perspectives, changing characters and social roles allow to construct a stage for multiperspective learning scenarios. Ad-hoc relationship, a free choice of preferred partners and situated relationships lead to the possibility to form free communities and learning groups. So traditional pedagogical concepts or models are expanded by an new model, that leads to more freedom in relationships, changing roles and characters and not at least reference to shared expertise and resources of knowledge.

III. EDUCATIONAL VARIABLES FOR VIRTUAL LEARNING ENVIRONMENTS

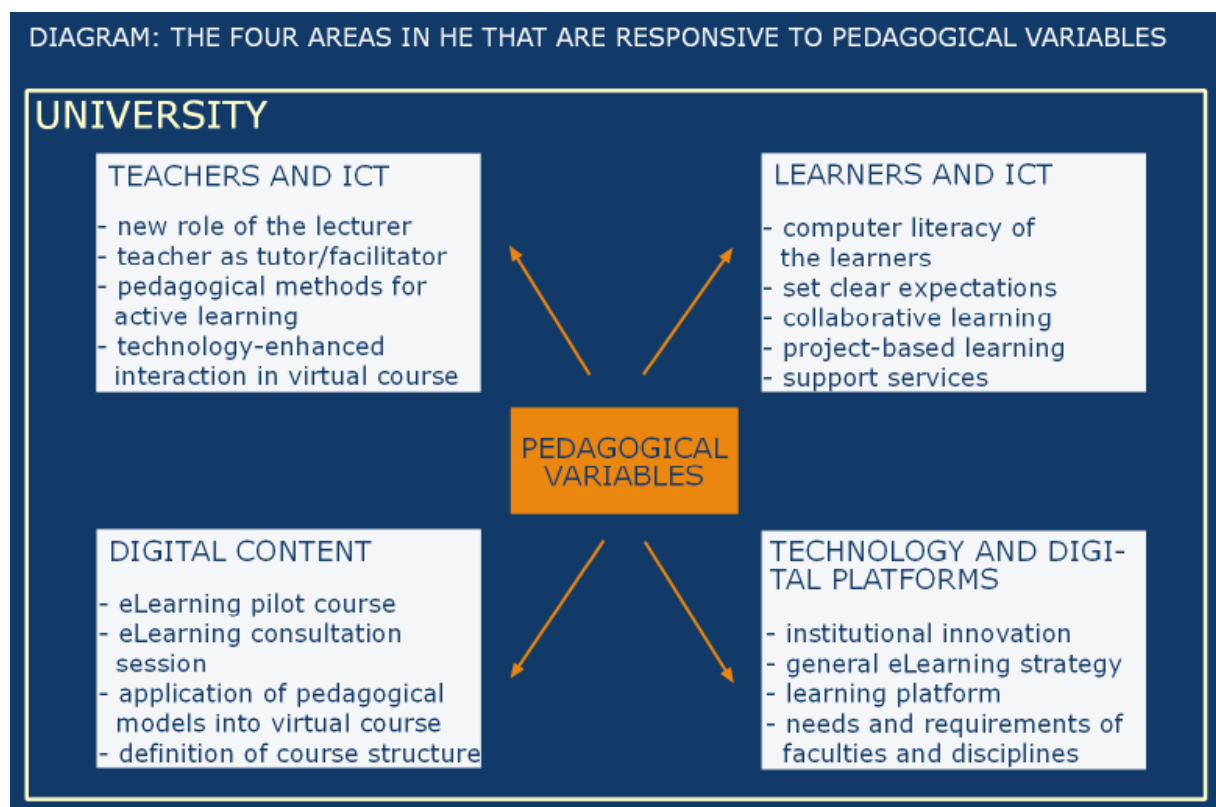
We have seen in the perception and dicussion of the pedagogical functions that the different teaching and learning situations require specific settings and environments which somehow have to be designed, produced and integrated into virtual learning environments. This final part of the background paper thus

collects all the different pedagogical variables which can be used for the rational creation and arrangement of ICT-based education.

After an initial enthusiasm there is nowadays a common agreement that the new technologies do not only offer advantages for the innovation of higher education. Teaching and learning in virtual learning environments is restricted by the constraints that are incorporated within the nature of technology itself. The scope of variation for arranging education in technology-based environments is limited by the borderlines the technology imposes on the different actors as well as on the learning materia.

In this sense pedagogical variables constitute the various small options that adding to a whole determine the interior of a virtual classroom, the design of the digital content and consequently the course for action of the teachers and learners working in a virtual environment. Metaphorically spoken you could compare the pedagogical variables with the total of bolts, nuts and screws that fix the larger parts of a motor block into their position and determine in this way the output of the machine. In order to reach a more exact structure of the diverse pedagogical variables, the subsequent analysis is divided into four areas that define or respectively are affected by the impact of ICT on teaching and learning in higher education. These areas are

- i. technology and digital platforms
- ii. digital content
- iii. teachers and ICT
- iv. learners and ICT



3.1. TECHNOLOGY AND DIGITAL PLATFORMS

The role of technology in universities can be seen as an agent of structural innovation and change. The current innovation in the higher education sector is caused by a variety of different factors. Nonetheless for the topic of online pedagogy the integration of new technologies into the teaching and learning processes of the universities is clearly the most important aspect. We can identify several variables in form of needs and requirements which contain pedagogical perspectives for the realisation

of technology-based learning environments. Such needs and requirements relate to more detailed topics of technology integration into teaching and learning.

The pedagogical variables that account for the design of technological learning scenarios and digital platforms are without doubt situated on the borderline between online pedagogy and the organisation of higher education institutions. At the crossroads between these two areas of higher education we encounter topics that originate from technological aspects as well as from the management of higher education. It is highly reasonable that the pedagogical variables in form of concepts and ideal learning scenarios should influence the institutional policy related to the integration of eLearning into the institution. But the pedagogical variables should regulate also within the technological boundaries the design of virtual classrooms. Additional tasks of the online pedagogy include the assessment of content management systems with regard to usability aspects, the organisation of digital information in virtual learning environments and the evaluation of administration tools for the tutoring staff.

With respect to the model of a collaborative European virtual university we can articulate some general pedagogical principles for the different levels of such a project.

a. All actors related to the integration of ICT into a specific university context have to understand electronic learning as an overall institutional commitment. The project management thus should

- ensure full support of the university administration for eLearning
- motivate the different players (IT/ faculty/ student services/ back-office administration) to cooperate in the project

b. The acceptance of the students for eLearning depends in a high degree on the support that faculty staff offers for all technical details related with taking electronic courses. The courses thus need to

- provide a concise and logical interface for information and registration
- simplify registration forms/ confirm registration by email

c. The selection of basic organisational variables are also a strategic decision for the preparation of an eLearning project, that means, to choose the kind of courses for the learning environment that is responsive to the needs of the students target group:

- will the course be tutor or learner-led?
- will synchronous or asynchronous learning be realised in the course?
- what size class do you foresee?
- where will the learners take the course? on campus? in a special learning lab? at home?

d. The integration of eLearning in your university needs a general framework for the courses that will be realised in the learning platform:

- the course framework offers general information about the course to
- attract the students
- register and orient the students
- keep them informed about the course
- help them navigate the course
- guarantee the compatibility of the earned degrees to traditional degrees

3.2. DIGITAL CONTENT

The digitalisation of the knowledge in higher education represents a second major area of technologically induced innovation in the universities. The new form of digital knowledge representation and availability induces new ways of information retrieval by the students and as a consequence demands new forms of information supply by the faculty staff. As described above in the text, the *shift from teaching to learning* demands the creation of new roles for the teachers as well as for the learners. The traditional way of classroom teaching meets with additional information and discussion channels in virtual workspaces. Online pedagogy is in charge to develop guidelines for the design of digital content and the interoperability of digital courses (or learning objects) in different learning platforms.

With regard to the pedagogical perspective for the design, development and use of digital content in virtual universities we focus our argumentation on the current mainstream in content development that is created in new media projects at the European universities. If we think in a general way, the majority of digital content can be classified as electronic courses that feature different media elements such as html - pages, graphics, animations, interactive exercises and a related library of documents most time available in Microsoft - formats or PDF format. Online pedagogy offers a set of variables that can act as guidelines for the design of such online courses and refer to every single stage in the production process.

Let us assume that you were the faculty member that is responsible for the realisation and management of an eLearning pilot - what would you do in such a situation? We have collected some advice that from the perspective of online pedagogy should be used as a guideline for the production process of a pilot eLearning course:

a. The realisation of the pilot starts with an eLearning consultation session for faculty staff in order find strategies to transform existing lectures to digital contents. The objective of the consultation is to convert classroom activities to virtual course activities in a meaningful way. Do not force learning content in an electronic environment if it does not make sense. Try to find items that can be digitalized as a case study, an animation, illustrated, produced a video or audio sequence etc.

b. The next stage in the production process is to apply pedagogical variables that are used in real lectures to the realisation of virtual learning sequences. You may base your electronic course in a well-known pedagogical structure for lectures such as

- classic tutorials (intro/ skill or concept teaching using examples and practice elements/ summary/ test)
- activity-centered lessons (intro/ preparation/ activity/ summary/ test)
- learner-customised tutorials (intro/ branch/ subject a - b - c/ summary/ test)
- knowledge-paced tutorials (intro/ test 1/ topic 1/ test 2/ topic 2/ summary/ complete test)
- exploratory tutorials (intro/ index/ home/ electronic database/)
- problem-based tutorials (intro/ home/ problem-based task/ summary/ test)
- generated lessons (intro/ test/ topic a - b - c/ summary/ test)

c. The pedagogical approach can help you to structure the existing learning material by arranging learning sequences for your digital content. Try to create the modular building blocks (that always appear in discussions about eLearning) for your lessons in a virtual classroom:

- design an orderly organisation
- design and sequence reusable modules
- integrate diverse orientation pages
- vary the representation of the content by using the different strengths of the diverse media types
- use text, where text makes most sense for the information representation
- use graphics and animations, where you can visualise certain topics and give concrete examples

- use interaction, where the content offers added value for the students by playing around with simulators
- use audio and video for the integration of interviews from experts in the fields

d. As users in a virtual environment neither have much patience nor a lot of direct help and orientation survives, it is important to use clear information elements in your navigation structure to tell students what exactly the course is about. Information elements for a basic orientation in a virtual learning environment should include items like

- welcome page
- roster page listing names and emails of staff and students
- course home page
- learner home page
- biographies of students
- syllabus page for virtual classroom courses
- teacher' s guides

Information and orientation sites in digital courses have developed some standard elements that may be good to use in the eLearning pilot. Some standard elements that are used widely and can be recommended serve as advance information for the course itself such as

- course announcement page
- detailed course description page
- objectives page
- biographies of staff members
- terms and conditions page
- course policies page
- copyright page
- legal contract page

Within the framework of the pilot course it is of great value to offer some orientation elements for the learning materia such as

- menu and table of contents
- index
- sitemap
- search page

Additional information elements enable the students to explore needed resources within the course content such as

- course resources page
- search the net page
- textbook description
- class project page

It is always a good strategy to clearly show the rewards students will have at the end of the course as well as to be informed as a teacher about the acceptance of the virtual environment. So explain the success and gather the feedback within your course by integration information options like

- diploma page describing to students the kind of certification granted after successfully passing the course
- congratulations page for successful candidates
- welcome feedback page inviting participants to articulate their thoughts

- pre-course survey page
- post-class feedback page

3.3. TEACHERS AND ICT

The current discussion within the scientific scholarship highlights the *shift from teaching to learning* (see chapter 1 - the ten ped. principles for details) as a paradigmatic change of the way we learn in Higher Education. This shift points to a new evolution in education that affects deeply the ways we are used to hold our lectures. The innovative powers of the new technologies pave the way for the construction of alternative paths to information sources for teachers and students alike. The faculty staff has to adapt to the new role of the lecturer, that is, to move from the traditional instruction style to a position where he tutors and facilitates the more independent, self-directed learning processes of the students. Online pedagogy needs to offer additional models for the realisation of this shift in teaching in higher education.

a. For our eLearning pilot course the consequences of the above described process result in measures that engage the involved faculty staff. It is essential to build up a local or to have access to a regional eCompetence program that train teachers in use of the different aspects of the new technologies such as

- the content management system
- the administration tools
- the communication tools
- the strengths and weaknesses of different types of media

b. The pedagogy offers a wide range of methods for the traditional way of learning in classrooms. These methods have been proved for a long time and quite some of their elements can be transferred and applied as pedagogical variables for teaching in the virtual classroom. Among these variables that define the interior of virtual learning environments you will find approaches as

- to attend to human factors/ make participants visible
- to create small classes with qualified tutor
- to offer prompt response
- to hold pre-class gathering
- to publish a comprehensive syllabus
- to prepare learners to participate
- to manage collaboration activities/ maintain collaborative channels
- to conduct live events
- to follow up after event
- to stay in touch after the class
- to monitor learning

c. Learning depends in a high degree from the internal motivation of the learner. As the shift from teaching to learning implies that the learner will actively have to follow his or her course of studies, we should try to integrate some features that are based on interaction. Technology-based activities serve the main objectives to activate learning in the virtual classroom. It is useful in this stage of the process to define the components of learning activities and to use the technology in order to realise common learning activities such as

- webcast
- presentation sequences
- drill and practice
- scavenger hunt

- guided research
- guided analysis
- team design
- brainstorming
- case study
- role - playing scenario
- group critique
- virtual laboratory
- project-based hands-on activity
- learning game

d. Technology-enhanced activities are a learning method that has to be treated with care, because things can always go wrong in technology. So you risk to frustrate your learners in activity settings if you do not give them every relevant information beforehand and cause therefore problems. So make sure that you support your activities with clear measures and information sets:

- select appropriate activities
- provide complete, clear instructions
- publish guidelines for message posting
- moderate discussion groups
- design entry forms to structure thought
- use internet as source for material

e. Communication over the net is a delicate process and needs special treatment for securing the objectives you have foreseen in your virtual learning environment by taking such active measures. Try to integrate measures like these when you use technology-based dialogue and communication processes to motivate the students in virtual classrooms:

- set clear expectations
- tell and ask learners
- require commitment
- make the course fun and interesting
- offer rewards/ gifts/ fame/ tribal membership
- pace and prompt learners
- schedule/ activities/ weekly contributions/ encourage learners
- provide feedback
- build learning community
- intervene with unmotivated learners
- redeem troublemakers

f. If the eLearning pilot includes exam situations the success of online testing depends once again on the planning process and the composition of the test itself. So it is essential to organise tests and exercise learning in virtual classrooms in a coherent way:

Some hints may help you to plan testing carefully

- why are you testing?
- what do you measure?
- how to grade the test
- how to deliver feedback
- how much time can learners take?
- how to cope with technical problems?

Consider that the type of questions that can be used with preference online is quite limited. Here are some types of question that you can select for your test:

- true/ false questions
 - multiple-choice questions
 - text-input questions
 - matching-list questions
 - click-in-graphics questions
 - drag-and-drop questions
 - simulation questions
 - fill-in-the-blanks questions
-
- explain the test
 - give meaningful feedback
 - consider alternatives to tests
 - let learners build portfolios and tokens

g. The internet offers access to an incredible amount of information. The pilot course can integrate the resources that are available in the internet in a limited scope. If you decide to let the learners venture beyond the core content of your digital course, include some external resources as

- libraries
- museums
- glossaries
- job aids
- mentoring
- conferences
- guided tours
- field trips
- simulations

3.4. LEARNERS AND ICT

The technology-based innovation of the higher education systems affects the way students organise their learning. The digitalisation of information leads to completely new forms of knowledge representation within universities. The traditional classroom system limited the access to relevant information for the students to printed documents and the lecture and discussion that evolved in the courses. The digital representation of knowledge adds new gateways for the students to the relevant documents they need for their learning.

We also have to take into account that the majority of students that enter the universities have already a high degree of experiences in handling computers and acting in virtual environments such as browsing, communication via email, forums and chat systems, searching the net for informations etc. In respect to the learners the online pedagogy is engaged to develop concepts for the various situations in which the students are confronted with elements of virtual learning environments. This means that the learner should be able to have access to all the necessary information within the eLearning environment.

a. The new technologies cause a merger process of the different kind of services that a university offers to them. The university administration has to take care that the integration of eLearning offers a consistent picture of the merging of different services in virtual universities such as

- paying the university fees

- offering student services
- giving academic assistance
- generating general discipline and course information
- assisting enrollment in the courses

b. The students have to know what is expected from them when they start an eLearning course. So it is an important preparatory action of the teachers to explain the students the fundamental differences between traditional and technology-enhanced courses and thus

- to explicate the different roles of traditional classroom learning and eLearning
- to motivate students to develop self-organised learning strategies
- to offer help for students starting with technology-based learning

c. Technology often fails or does not function the way we expect it to function. In a virtual learning course this might lead quite fast to a demotivation of the participants and ends finally in a high rate of drop-outs. To avoid this situation the teachers have to offer full student support for all eLearning related problems:

- computer-related problems
- admission requests
- course selection queries
- enrollment in classes
- provide academic advice
- provide personal assistance

d. When a problem emerges, we would like to get immediate help. So if a student does not cope with a certain situation in the course, it will be helpful to allow different communication channels for support:

- web-based channels
- telephone
- face-to-face

e. Learning communities are enriching the learning process in virtual learning environments and can serve as a good base for the students to exchange ideas and find collaborative solutions for certain tasks. But a vivid learning community depends on a high level of support from the teachers to build up and promote collaboration between the learners. Some steps that can foster a learning community are

- to stimulate the creation of learning communities offering the students mutual support
- to try to build learning communities based on personal relationships between the students
- to enhance team building with project-based tasks in the learning communities
- to create 2 - person teams for working on special tasks
- to allow fun and humor and create interest in your virtual classrooms
- to integrate a personal touch of the participants in the learning community
- to determine the kinds of collaboration mechanisms
- to implement collaboration policies

f. The internet offers specific collaboration tools that are useful for the communication in learning communities such as:

- email
- discussion groups
- chat
- whiteboard
- screen sharing

- response pads
- audioconferencing
- videoconferencing

g. The best thing to avoid technical problems in an eLearning pilot is to test the whole system in advance. But the running course also will need a contact opportunity for learners who get lost. So try to integrate support measures in your eLearning pilot such as

- to plan technical support
- to provide complete instructions including instructions on used tools in the virtual classrooms
- to solve problems in advance
- to support learners
- to test your course

The list of pedagogical variables for virtual learning environments is by no means considered complete. The objective of the definition of variables for online pedagogy is rather to illustrate, in which way we can apply our pedagogical thinking and ideas to the design and integration of ICT into the higher education area.

IV. A FUTURE PERSPECTIVE: THE CONCEPT OF eCOMPETENCE FOR ACADEMIC STAFF IN HIGHER EDUCATION

As we have learned from the reports of the participants in our workgroup *online pedagogy*, elearning is on its way in the European universities. But there remain a bunch of problems to be solved. Frequently, eLearning implementations in universities do not fit well with existing institutional cultures, values, structures and pedagogy. Key issues that must be addressed in order to ensure effective use of ICT in European Higher Education include: the shift in emphasis from teaching to learning, the changing role of teachers, pedagogical approaches, the complex interactions between various specialists and departments, quality assurance and organisational change. Therefore, the issue of staff development and qualification in e-learning must be embedded in wider strategies for institutional innovation.

As a consequence of these challenges we have proposed a project to the *DG EAC* (Directorate Generale of Education and Culture) of the EU that is called *European eCompetence Initiative for Higher Education Staff*. “eCompetence” requires careful definition that reflects the range of aspects spanned in Higher Education organisations. For example, the *eCompetence of an individual staff member* centres on their use of eLearning in a lecture or course, whereas the *eCompetence of an institution* focuses on strategies to implement eLearning in a complete study programme or set of courses.

In the context of Higher Education, we define *eCompetence* as the integration of pedagogical concepts and institutional frameworks into the process of technological innovation in teaching and learning. We believe that *eCompetence* will be one of the key, decisive factors in the full exploitation of the potential of new media. Further, sustainable diffusion of eLearning will be dependent on the competencies and the commitment of all those involved in Higher Education.

The aim of the *European eCompetence Initiative* is the development of an appropriate qualification for academic staff (in Higher Education) in the use of ICT in teaching and learning. Specifically, it aims to undertake a wide ranging study of current eCompetence training, a needs analysis across the sector, and to develop examples of blended learning scenarios that combine face-to-face and online modules in a coherent manner. Whilst *eCompetence* has been referred to in a number of projects funded under

the eLearning Action Plan, there has been, thus far, no substantial in-depth analysis or development of the theme on a European level for academic staff in Higher Education. We see the *eCompetence Initiative* as a logical follow-up action to be taken in order to secure the involvement and active participation of the key persons at universities and thus to enable a sustainable integration of ICT in Higher Education.