ECOMPETENCE AND EFFECTIVE PRACTICES IN HIGHER EDUCATION

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Introduction

The European Commission has declared eLearning as a key element in the long term strategy of the *eEurope Initiative*, aiming "… to ensure that the European Union fully benefits from the opportunities offered by the Information Society Technologies" (DG EAC 2003). Within the *eLearning Action Plan*, the DG EAC has identified the importance of "…training of European teachers and trainers" as well as the "… facilitation of cooperation and networking between actors" (DG EAC 2001).

Whilst *eCompetence* has been referred to as a subtopic in a number of projects funded under the eLearning Action Plan, there has been, thus far, no deeper analysis or development of the theme on a European level for higher education. The *European eCompetence Initiative* (www.ecompetence.info) is an attempt to respond to the challenges mentioned above and to develop a substantial in-depth analysis of the theme for Higher Education.

One major research goal of this initiative is 'to give insight into eCompetences needed in higher education or addressed in eCompetence development programmes in Europe'. In this paper, we describe this part of the eCompetence Initiative and our analytical framework. This framework is based on the theoretical notions of *social construction* of communication technologies. The basic idea is that there is a dynamic relationship between technology and organisational form. By applying this framework, we want to avoid the pitfall of putting technology mediated education in the middle of our analysis. We apply this framework in our analysis of 33 practical, effective practices in the use of educational technologies and/or of eCompetence development programmes. We describe our method and results and provide a set of recommendations for further development of such programmes.

1. The eCompetence network

The *European eCompetence Initiative* is a network that examines strategies for the development of individual and organisational eCompetences in Higher Education. Twenty three partner institutions from European member countries, Switzerland, Turkey and South Africa contribute to this project, with participants serving different functions within their institutions. They work as teachers, researchers or developers, as managers, technology experts or staff developers. Additionally, these individuals also represent a variety of different higher education institutions, including traditional residential institutions, some with mixed modes of delivery, as well as those based predominantly on distance education. The partner institutions also differ with respect to their use of technology in education. Some show recent, still modest, uptake of technology, often only in some organisational sub-units, while others are more experienced, have institutional strategies implemented and show an intensive use of educational technologies. Although this group does not represent the European higher education area in rigid quantitative terms, its heterogeneous composition reflects very much the variety of uses and implementations of educational technologies in higher education. Clearly, the

The Challenge of eCompetence in Academic Staff Development, Mac Labhrainn, I., McDonald Legg, C., Schneckenberg, D., Wildt, J., Galway: CELT, 2006.

network is an ideal context for an analysis of effective practices in the use of educational technologies and/or of eCompetence development programmes.

1.1 *A model to describe effective practices in the use of educational technologies*

Many authors who deal with educational technologies in higher education also address organisational questions. Khan (2001), for example, developed a 'framework for eLearning', which has eight dimensions: institutional, pedagogical, technological, interface design, evaluation, management, technological and ethical. Similarly, Kerres (2001) developed a 'quadrangle for innovation via media didactics', which again comprises eight dimensions: educational contents, educational methods, production, distribution, organisation, personnel, support and infrastructure.

Even if both concepts are very comprehensive and succeed in covering many aspects of educational technologies, they also have some shortcomings. Both put technology mediated education in the centre of their observation and pay little tribute to social actors involved or to other forms of education. Being highly integrated and comprehensive, both concepts tend to set eLearning as an absolute goal, as if education has to be organised around the use of technology, as if eLearning itself would be a single, clear cut concept, which in practice would suggest highly standardised technology, a single organisational model and similar educational processes.

To avoid deterministic assumptions, we base our analysis on theories about the social construction of communication technologies (Fulk, 1993). These theories propose that neither technologies nor organisational settings are given in an absolute sense. Therefore, it would be wrong to assume a linear, uni-directional relationship. Rather, it seems to be more appropriate to think about the "dynamic relationship of communication technology and organisational form" (Fulk and Desanctis, 1999, p. 6), a relationship that is constituted by social agents, their attitudes and their practical uses of technologies, which converge in social systems.

Additionally, we cannot assume that the development, implementation and use of technologies, as well as related educational processes take place on a single organisational level. Rather, we expect practices in the use of educational technologies to evolve on different organisational levels and in different arrangements of social actors. We therefore take actual practices as our unit of observation and ask ourselves how they are influenced by actors in education, educational technologies and educational processes.

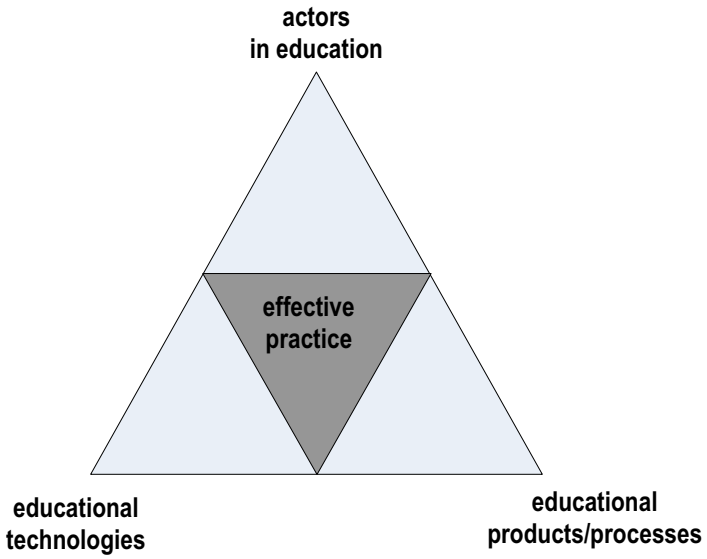

Figure 1: A framework for the analysis of effective practices in the use of educational technologies

1.2 *Method*

We began with a survey to draw from the diverse practical experiences of our partners. For this survey we used an online questionnaire to generate descriptions of effective practices, or solutions, for the use of educational technologies at higher education institutions. As opposed to theoretical models, plans or policy statements, we wanted to receive descriptions of *actual* patterns of activities which have been undertaken in real contexts.

This questionnaire was based on the example of the *EDUCAUSE Effective Practice and Solution* database[1]. As there, we asked our partners to provide us with a compact description, of a few paragraphs, of a practice or solution they relate to the issue of eCompetence. The descriptions had to contain the following elements:

- Title
- Background, or challenge that was to be tackled
- Practice or solution, a description of the activity
- Benefits
- Shortcomings
- Future plans

We received 33 responses from across the consortium: very different, heterogeneous examples of 'effective practices.' These can be found on the website of the eCompetence Initiative (www.ecompetence.info). To analyse these and other contributions from our partners, we use the distinction between actors in education, educational technologies and educational processes.

2. Participants in education

2.1 *Providers of services and support*

With respect to the providers of ICT-related services in higher education, we can distinguish between supra-institutional, institutional and institutional sub-unit levels: thus comprising departments, groups and small networks, as well as individuals.

Supra-institutional level

Although the supra-institutional level can contain international actors, such as the *European Commission* and its ICT policies (Schneckenberg 2006a), here we mainly refer to the context of national higher education systems. Ministries for Education can play a strong role, e.g. by setting up earmarked funding schemes, such as the Irish 'Training the Trainers' programme (Mac Labhrainn 2006 ep[2] 1), or by reacting to project proposals, as in Greece, where the *Greek University Network* (Balaouras et al. 2006a ep 3) proposed to adapt a learning management system for the Greek language. More comprehensive and more integrated, are consortia of universities, which are co-funded by their ministries. Some of these consortia set up virtual organisations, like the Dutch Digital University (De Volder 2006a) or the Finnish Virtual University (Rissanen 2006 ep 20), which, in return, provide infrastructure, support and training for their consortia members.

[1] By 2004, this was still an independent database. In the meantime, effective practices have been integrated into the EDUCAUSE Resource Center (http://www.educause.edu/Search/644).

[2] ep means "effective practice" and the numbering scheme refers to the order in which these examples are stored in the eCompetence Initiative database.

Institutional level

At the institutional level, support units of different shape and mission can play an important role in the use of educational technologies. The *Network Operations Centre* at the University of Athens (Balaouras 2006b ep 12) primarily deals with technical issues, like the maintenance of the learning management system and the provision of technical support. In contrast to that, the *Department of Education and Learning* at Aalborg University (Kanstrup 2006 ep 18) or the *Centre for Excellence in Learning and Teaching* at the National University of Ireland, Galway (Booth ep 23) are more focused on didactical developments and teaching support. The unit for *Telematic Learning and Education Innovation* at the University Pretoria is a mix of both types, since it has coordinated the technical integration of campus systems (Le Roux and Jordaan 2006 ep 3), provides systematic training for staff (Fresen 2006 ep 4) and gives consultancy to departments to achieve a faculty-wide roll out of learning technologies (Steyn 2006 ep 6).

It also can be an option to use academic groups or networks to supplement, or to partially substitute for, support units. At the University of Graz, the vice-rector for teaching summoned a group of representatives from different faculties to steer the further development of central eLearning activities (Pfeffer 2006 ep 25). At the University of Dortmund, a self-organised network was initiated by an academic department, the *Centre for Didactics in Higher Education*, to promote the institution-wide exchange of experiences, to provide training and to develop a qualification scheme (Schneckenberg 2006b ep 15).

Additionally, it has to be mentioned that sometimes services can be outsourced to private companies as well. The National University of Ireland, Galway contracted a small company to provide specialised staff training courses for its staff (Booth 2006 ep 23).

Sub-institutional level

One type of provider at the sub-institutional level can be the cross-institutional, discipline-oriented network. The *European PhD on Social Representation and Communication* is organised by a *Marie Curie Multipartner Training Organisation* that includes members from 8 universities in 6 different European countries (De Rosa 2006 ep 24). The department of Computer Science at the University of Joensuu cooperates with regional high schools for the provision of the study programme ViSCoS (Virtual Studies of Computer Science) (Suhonen 2006a ep 14).

Another type of actor is a team that holds responsibility for a study programme at a single university, such as a course committee, study board, teacher commission and the like. For example, at the Autonomous University of Barcelona, teacher commissions organise learning material repositories for the common body of knowledge, specified for the disciplinary fields of individual study programmes (Rué 2006 ep 31).

A small group or an individual researcher/educator can be yet another type of developer and provider of technology based educational products. The *Educational and Language Technology Group* at the Department of Informatics and Telecommunication at the University of Athens develops rich content and interactive simulations for certain modules in computer architecture (Grigoriadou 2006 ep 8) or personalised learning environments that accommodate individual learning styles (Papanikolaou 2006 ep 9). At the Autonomous University of Barcelona, some courses aim at combining the teaching of specific content with the training of skills to use particular software, e.g. the creation of didactic units for basic language training in combination with a standard multimedia presentation tool (Prat Pla 2006 ep 32), or a course on organisational development in combination with software for concept maps (Tomàs 2006a ep 29).

2.2 *Target groups of services*

Institutions

In a broader sense, higher education institutions as entities can be regarded as one target group for educational and technological services. The consortia we referred to above mainly provide general infrastructure, information and support to all the members of their communities, but our partners have not mentioned customised services that are addressed at individual institutions.

Organisational sub-units

The situation is different for another type of target group, organisational sub-units like departments or study boards, which are more frequently addressed as entities. In the case of University of Pretoria, the Department of Telematic Learning and Education Innovation, an academic support unit, offers support and consultancy to individual academic departments to cater for their specific needs. Typically, the support unit is invited to a general meeting of the academic department and both jointly set up a work group for further development (Steyn 2006 ep 6). A similar approach is taken by the Department for Education and Learning at the University of Aalborg, also an academic support unit, which approaches academic study boards that are traditionally composed of students, teachers and an administrative leader. In several steps and workshops, the process starts in a very open format, gradually becoming more specific and leading to the formulation of a strategy for the study programme (Kanstrup 2006 ep 18).

Faculty/Academic Staff

The most frequently mentioned target group in our responses was *faculty* (ie academic staff). They can be approached in different ways. The *Department for Lifelong Learning* at the University of Oslo set up a portal for online pedagogy, providing bite-sized pieces of information on eLearning, the institutional learning management system and a toolbox for teaching online (Koch 2006 ep 27). At the Autonomous University of Barcelona, the vice-dean of Teaching Innovation at the Faculty of Education moderates a self-organised group of teachers, which shares experiences with the help of 'best practice cards', fosters interdisciplinary teaching projects, and hires experts for pedagogical and technological support on a daily basis (Tomàs 2006b ep 5). The *Laboratory of Pedagogical Engineering* at the University of Technology of Compiegne Bât offers two-day seminars on the structuring and transposition of course materials into XML, in combination with a consecutive phase of individual coaching (Piault 2006 ep 17). The *Digital Chalk* staff training programme at the K.U. Leuven consists of four elective modules, each of which lasts 3 hours: an introductory module on the basic functionality of the institutional learning management system; a design module for analysing the individual teaching practice of each participant; a module about information, focusing on materials from a technical and didactical perspective; and a module about communication, exploring the respective functionalities of the platform (Van den Branden 2006 ep 21).

The University of Pretoria offers five consecutive staff training courses of sequentially increasing complexity, applying Salmon's (2000, 2002) theories on E-moderating and E-tivities to the practical training in the use of the institutional learning management system (Fresen 2006 ep 4). The National University of Ireland, Galway bought in an online distance learning course based on the same model. In parallel to the regular work of participants, it takes place over a 5-week period and is delivered via the institutional learning environment (Booth 2006 ep 23). The Finnish Virtual University offers two different staff training programmes to members of their partner institutions, the *TieVie Teacher Training Programme* (5 credit units) and the *TieVie Expert Training Programme* (10 credit units), for staff members who plan to become facilitators for other teachers, or to manage eLearning for entire study programmes or organisational units. Both are provided in a combination of national workshops, online modules, individual and group work (Rissanen 2006 ep 20). The Open University of the Netherlands also uses the distinction between two target groups and respective competence levels, but in a different way. It offers a course for students called "Mouse-based learning". To prove mastery in this course is a prerequisite for teachers to participate in the staff training course "Mouse-based

tutoring," which consists of web-based materials and a two-day online workshop (De Volder 2006 ep 22).

Students

Most of the examples reported from our partners dealt with traditional student populations in undergraduate and graduate degree programmes. The target group of the European PhD for Social Representation and Communication are doctoral students from all over Europe (De Rosa 2006 ep 24). The Open University, Netherlands (De Volder 2006 ep 22) caters for remote adult learners and the Distance Education Study Centre at Riga Technical University, for adult learners in a specific regional environment. A very special case is the programme *Virtual Studies of Computer Science* that mainly addresses high school students at remote partner institutions, providing them with the opportunity to acquire credit points for the first year of a university degree programme, while still being enrolled at school (Suhonen 2006a ep 14).

Modes of delivery strongly cohere with the respective target groups. Predominantly, our partners report about the use of educational technologies in traditional residential settings, or as additional tools in traditional distance education. Most of the reported practices can therefore be regarded as aiming at a variety of *blended learning* scenarios. Only the last example given above offers full online and distance education, but still uses local tutors.

3. Educational technologies

3.1 *Institutional level*

Even if the composition of our group was biased towards people with a strong interest in educational technology, we still were surprised how many of our partners reported to be involved in technological developments. This already is true for the supra-institutional level, but even more so for the institutional level. The University of Athens, for example, contributes to the development of a learning platform for the Greek language context (Balaouras et al. 2006a ep 2). The Işık University in Istanbul has developed its own course homepage management system for the dissemination of course descriptions and learning materials (Kuru 2006 ep 19). Both the University of Pretoria (Le Roux and Jordaan 2006 ep 3) and the K.U.Leuven (Van den Branden 2006 ep 21) reported ongoing efforts to integrate commercial learning management systems with other, partly self-programmed enterprise software and to continuously adapt their technologies to the changing demands of their respective institutions.

3.2 *Sub-institutional level*

It can also be necessary to create technological environments for smaller organisational units, not only for the entire institution. At the University of Barcelona, teacher commissions set up virtual libraries specified for individual study programmes (Rué 2006 ep 31). Another example is the website of the European PhD for Social Representation and Communication that works as a comprehensive technical environment for the study programme (De Rosa 2006 ep 24). The programme Virtual Studies for Computer Science is generally delivered via a learning management system, but has developed some additional tools for specific tasks, e.g. a visualisation tool for programming activities, a web-based ethical argument tool, and a learning process companion that combines a digital learning portfolio with tools for creative problem solving (Suhonen 2006b ep 30).

3.3 *More specialised tools*

Even if learning management systems are very comprehensive tools, trying to support nearly every educational activity inside the setting of individual courses, it is by far not the only educational technology to consider. First of all, there exist widely used desktop applications like word processing

and layout, spreadsheet and presentation software, Internet-browsing and email, etc., the competent use of which cannot always be assumed as a given, not even among faculty (De Volder 2006b ep 22). Apart from that, there sometimes exists the need to apply or even develop more specialised software for specific educational activities. In a course at the University of Joensuu, a specialised tool was used to support collaborative writing of papers and to track contributions of individual students (Marjomaa 2006 ep 10). Our partners from Altran SDB have contributed to the development of tools that apply various techniques from *Customer Relationship Management* to eLearning scenarios, e.g. by quantitatively analysing the activities of masses of students in large courses (Arjona 2006 ep 7). The Digital University (Netherlands) has developed a tool to create competence profiles for individuals, teams and organisations, which support the management of competences at different levels (Stalmeier 2006 ep 28).

4. Educational products and processes

4.1 *Specified uses of educational technology vs. eLearning*

Frequently, the term eLearning is understood only in a very narrow sense, as a specific mode of delivery for fully online distance education. This understanding can carry a high potential for frustration (e.g. why is there no bigger market for eLearning?), or for limiting one's view (e.g. where do I find 'proper' eLearning?). And it can lead to useless debates, e.g., about the superiority/inferiority of eLearning versus 'normal' learning.

Since only a few partners reported to aim at new target groups or to fundamentally change their basic mode of delivery, it seems fair to assume that most of them aim at improving or supplementing their existing educational practices and products. Therefore, it seems best to avoid the over-determined term eLearning and, instead, speak about specific uses of technologies in teaching and learning. This better reflects the actual situation, predominantly characterised by a wide range of blended learning scenarios and often showing a limited and selective use of technologies.

4.2 *Distinguishing between educational goals and modes of delivery*

One additional benefit of this approach lies in the potential to regard the use of information technologies in education not only as a means (e.g. a different mode of delivery), but also as a potential end (e.g. an educational goal) of teaching and learning in higher education.

Both explicitly and implicitly, several of our descriptions reported on the aspect of 'delivery', i.e. the impact of technology on the way teaching and learning is performed. Many descriptions dealt with the hope that technology can improve the efficiency of knowledge transfer and learning, e.g. by enriching learning materials, by shifting toward more individualised learning scenarios or by increasing interaction among students.

However, it is also necessary to acknowledge the need to teach skills for the use of information technologies and electronic information resources as a major goal in its own right. This makes sense in a situation where culture in general and academic culture specifically, relies on labour and communication that is increasingly mediated by information technologies.

4.3 *Information literacy*

To train and educate for a competent and critical participation in the technology-based culture of the knowledge-society is a major task of higher education. Having said that, it is necessary to acknowledge that even basic computer skills should not be taken for granted, neither among students, nor among faculty. Colleagues reported problems with training in the use of more advanced learning scenarios or educational software/tools, when participants already lacked basic skills. Other partners mentioned training in basic software or introductory courses in the tools and information resources of

the institution. A more comprehensive approach to raise the computer skills of students was developed by George Mason University. The programme Technology Across the Curriculum has established ten goals for the basic use of computers that have to be achieved by liberal arts students (Holisky 2001). Other actors see these skills as parts of general information literacy for the knowledge society. The Association of College and Research Libraries, for example, defined the following Information Literacy Competency Standards for Higher Education (ACRL 2000, p. 2-3):

"An information literate individual is able to:

- *Determine the information needed;*
- *Access the needed information effectively and efficiently;*
- *Evaluate information and sources critically;*
- *Incorporate selected information into one's knowledge base;*
- *Use information effectively to accomplish a specific purpose;*
- *Understand the economic, legal, and social issues surrounding the use of information and access and use information ethically and legally."*

4.4 *Digital culture*

Broader, more general remarks in that respect have been to create a digital culture (Balaouras 2006b ep 12), to support the transfer towards a knowledge society (Kapenieks 2006 ep 26) or to prepare students for the real world that increasingly demands the ability to work collaboratively regardless of location and time (Steyn 2006 ep 6).

4.5 *Using existing, and producing new, knowledge resources*

In some cases, the use of existing knowledge resources was mentioned as an educational goal or activity. For example, one of the assignments of the study programme Virtual Studies of Computer Science, is to make a small investigation on a given subject, not by using ready-made learning materials, but by using the Internet and the library as knowledge resources (Suhonen 2006b ep 30).

Several practice descriptions mention activities concerning the production and provision of electronic materials. The Educational and Language Technology group at the University of Athens produces enriched materials, animations and simulations (Grigoriadou 2006 ep 8), while the course for Language and Literature Didactics at the Autonomous University of Barcelona deals with the production of multimedia-materials (Prat Pla 2006 ep 32). While these are comparatively complex materials, other descriptions describe materials produced by using regular office software or learning management systems.

4.6 *Supporting existing vs. creating new educational settings*

In most cases, practice descriptions reported activities to support or supplement pre-existing educational settings, such as entire study programmes or single courses, which partly explains the wide use of course management systems - a technical support focused on traditional classes and course structures.

New educational approaches and contexts are also emerging as additional, complementary approaches to teaching and learning, rather than as wholesale replacements for traditional teaching. Electronic student portfolios, for example, can be used across the modularised and fragmented structure of many study programmes by spanning across a range of courses that students take. The creation of knowledge/learning communities for students across different courses is also an attempt to transfer

knowledge, skills and understanding between courses and to help students to gain a broader, comprehensive and integrated picture (De Vries 2006 ep 13).

4.7 *Self learning vs. increased supervision*

Frequently, aims such as the facilitation of autonomous learning (Rué 2006 ep 31), stimulation of self-motivation and evaluation (Grigoriadou 2006 ep 8), or to personalise learning environments that accommodate learner's individual differences (Papanikolaou 2006 ep 9) are mentioned, which are indicative of a focus on student centred and independent learning.

On the other hand, the use of customer relationship management techniques (Arjona 2006 ep 7) or of tools to track individual contributions in group work (Marjomaa 2006 ep 10) is not only a form of increased control, but also provides prerequisites for improved, more individualised supervision. Self learning scenarios and increased supervision therefore are not necessarily contradictory, but rather complementary elements, which is also expressed in the concept of Guided Independent Learning that is used at K.U.Leuven (Van den Branden 2006 ep 21).

5. Competences to effectively use educational technologies

As these examples make clear, the effective use of educational technologies requires a set of different, but strongly interrelated competencies. Taking the basic framework we introduced earlier a step further, it is possible to distinguish three basic categories of competence:

- *Pedagogical* competences
- *Technical* competences
- *Organisational* competences

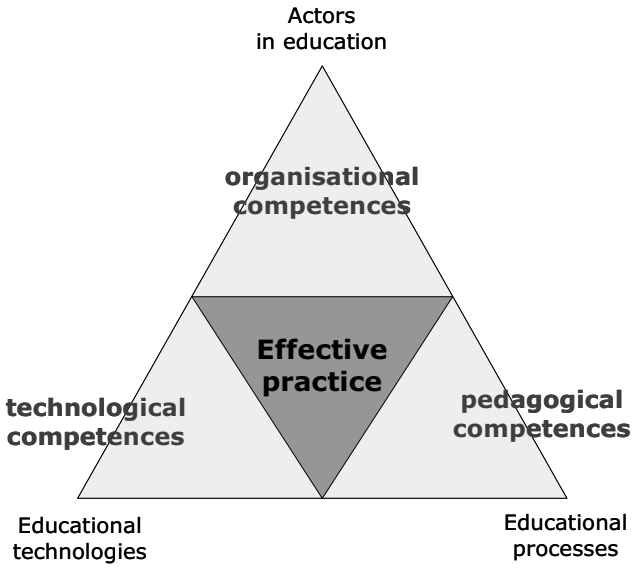

Figure 2: eCompetence as a set of pedagogical, technical and organisational skills

5.1 *Pedagogical competences*

Pedagogical competences can be defined as *the ability to influence educational products and processes*. Drawing from the observations made above, the following competences can be identified as useful for educators or higher education institutions in creating and performing an effective practice:

Basic pedagogical competences

To apply standard software to discipline specific tasks is a basic, but not a trivial skill. For example, the ability to structure a research paper according to the publication standards and formats of a discipline is more than the mere knowledge about the functionality of word processing software.

Another basic educational competency is the ability to use electronic supplements for existing educational products and processes, such as the provision of electronic documents or the use of electronic communication devices as an add-on to other forms of communication. The appropriate context for this skill is the standard course and traditional teacher / learner scenarios.

Advanced pedagogical competences

More advanced educational competences are required for blended learning scenarios, where some elements of learning arrangements fully rely on educational technologies, while others are delivered in more traditional ways. It requires additional expertise and confidence to choose and to switch between different modes, finding a good mix of adequate solutions for each educational problem.

The broader perspective on entire study programmes instead of single courses also can be seen as an advanced educational skill, since it is necessary to distinguish between different levels (e.g. course/study programme) and to analyse similarities and differences between courses before being able to develop applications, which are of use for the entire study programme.

One specific competence that illustrates this is the ability to create a comprehensive environment of knowledge resources for the study programme and to share content beyond the borders of the individual course on the level of the study programme.

Very advanced pedagogical competences

Even more competences are required to develop or to implement entirely new applications, which have not yet existed in an educational arrangement. An example for this could be the development of e-portfolios, which is a new phenomenon in many higher education institutions, creating educational processes that run across fragmented, modularised course collections.

A step further is the creation of more customised learning arrangements to meet the individual needs of students. The ability to publish content may also be considered as a further increase of skills, since publishing requires more advanced forms of conceptualisation and quality control.

5.2 *Technical competences*

Technical competences can be defined as *the ability to use technical tools and to influence technical environments*.

Basic technical competences

Often neglected, but still a necessary requirement for meaningful use of educational technologies, are basic computer skills. For example, the use of standard software packages for personal computers for document management, editing of text documents and layout, spreadsheets, web-browser and email-software. Higher education institutions increasingly become aware of their responsibility to foster these skills among students and faculty and offer, for example, the *European Computer Driving Licence* (ECDL) as part of their staff/student training programmes.

Since the distribution of learning management systems is an important trend and a common phenomenon in higher education, the ability to use the core features of standard learning management systems becomes a new basic skill both for students and faculty.

Advanced technical competences

In both cases mentioned above, basic competences mean the ability to use given technical tools. It is a comparatively more advanced competency to select among functionally equivalent tools, to adapt them for specific needs and to integrate them with other tools. This applies both to individuals as well as to institutions, which can have the problem of choosing between different learning management systems, to adapt the selected tool to specific needs and to implement it into a given technical environment.

The ability to create comprehensive and integrated technical environments is a specific competency that goes beyond the maintenance of separate, individual tools. For organisational units or entire institutions, it is a sign of advanced competency if they are able to set up common content management systems, which support the sharing of content beyond single courses. Frequently, these tools come in addition to learning management systems.

Very advanced

On an even higher competence level are skills to develop new educational technologies. On an individual level, these skills can mainly be found among researchers with a background in computer sciences. But there are also higher education institutions that invest in the development of their own educational technologies.

Technically more challenging is also the implementation and maintenance of open archives and repositories, since they should not only fit into local environments, but also be compatible with other archives/repositories worldwide.

5.3 *Organisational competences*

Organisational competences for the use of educational technologies in higher education can be regarded as the ability to participate in and to influence social settings.

Basic organisational competences

The most basic organisational arrangement in higher education is of the single class or classroom, which serves as the core "production unit" for education. The roles of teachers and students are rather standardised, with the autonomous teacher being solely responsible for the design of educational products and processes, while the students have to blend into this arrangement as more or less receptive "consumers."

Kerres (2005, p. 161) calls this individualised production structure the "principle of the chair-holding professor" ["Lehrstuhlprinzip"], where the individual teacher is solely responsible for a complex set of tasks, like the definition of relevant content, the design of the course, the teaching and the assessment. To successfully act under these organisational conditions, a teacher needs the competency to simultaneously fulfil the complete set of different tasks. From an organisational perspective, many study programmes are composed out of similarly designed courses, and many higher education institutions are composed out of similar, very individual and small production units.

Under these organisational conditions, it makes sense to use educational technology as a support for the individual teacher and to focus on the course as the main production unit. This is basically what learning (or better, course) management systems are doing. Since the actual use of the provided educational technology is the responsibility of the individual teacher, the uptake and intensity of use can differ widely between teachers, e.g. ranging between enthusiastic pioneers and hesitant laggards.

Advanced organisational competences

In comparison to higher education institutions, which nearly exclusively hand over the responsibility for education to highly autonomous individual teachers (a type of institution that often can be found in the Humboldtian system), it is a more advanced organisational competence to have specialised academic support units that can focus on the improvement of teaching and learning. This phenomenon is more common in higher education institutions with a stronger managerial approach, as in the UK, Irish, Benelux, or Scandinavian higher education systems.

These educational specialists and support units create a different organisational context for the use of educational technologies. Without these specialised units, it would not be possible to design and implement institutional strategies. Since they represent and communicate these strategies, they also play an important role in creating a common understanding on the specific relevance of educational technologies among faculty at a given institution. The need for this common understanding for the development of the entire institution was frequently mentioned by our partners.

Another advantage of educational support units is their ability to address and engage with organisational sub-units, e.g. departments or study commissions, and provide them with customised consultancy and support.

Very advanced organisational competences

While the previously mentioned educational experts and support units do not necessarily challenge the status of the autonomous, individual teacher and the classroom as the only relevant production unit, increased collaboration with support units or among faculty (e.g. team teaching) can also lead to the need for a re-organisation of workflows and a re-distribution of workloads.

Closely related to this is the question of reward models and gratification schemes. This does not only apply to faculty (e.g. how to assess the work of a teacher, if it is not done by contact time), but also to students (e.g. how to acknowledge and reward work outside a normal course, such as maintaining a portfolio).

Very advanced, and not seen too often so far, is the organisational ability to create new revenue streams by reaching out for new target groups or by changing business models, or to create new cost saving models, e.g. by focusing on an open knowledge / open source policy.

All the competences we have discussed at the various levels are summarised in table 1, below.

Pedagogical competences	**Technical competences**	**Organisational competences**
Basic • Information literacy in academic field • Supplement existing processes and products • Standard course, standard teacher/learner scenario	*Basic* • Basic computer skills • Maintenance and/or use of standard learning management system	*Basic* • Standard individual (teacher, student) • Standard class as "production unit"
Advanced • Blended learning scenarios • Study programmes	*Advanced* • Selection, adaptation, integration	*Advanced* • Educational support experts and units

• Shared content	• Comprehensive environments • Content management systems	• Strategies and joint understanding • Address academic subunits (departments, study boards)
Very advanced • New applications (e.g. portfolios) • Individualised, customised learning arrangements • Publication of content	*Very advanced* • New tools, self developed • Open archives/repositories	*Very advanced* • New workflows and workloads • New reward and gratification • New business models

Table 1: Different levels of eCompetences

6. Conclusions

In this paper we have described our analytical framework and analysis of 33 effective practices, both applying educational technologies and/or describing eCompetence development programs. Here we want to discuss our framework, summarise our results and give some further recommendations for further development.

Based on theories of social constructivism, we conceptualised effective uses of educational technologies in higher education as outcomes of the dynamic relationship between actors in education, educational technologies and educational products/processes (figure 1). After having used this concept to analyse 33 practice descriptions, we took it a step further and formulated three interrelated competences for the development of effective practices: pedagogical competences, technical competences and organisational competences (figure 2). Finally, we suggested a grid to distinguish between different levels of these competences (table 1).

In comparing practice descriptions, we found this concept especially helpful to highlight differences between institutions. It became obvious that different organisations have different problems and therefore often come to particular solutions which are most appropriate for their current situation. For example, some institutions are still concerned with the implementation of their first virtual learning environments, while others already have the problem of integrating their learning environment with other enterprise software. It also makes a big difference if the institution is organised in a more 'managerial' way (for example, in many northern European higher education systems), e.g. characterised by the existence of specialised support structures for educational development, or if they are organised in a more 'collegial' way (as in Humboldtian systems), which rather rely on the self-organisation of academics. *To a large extent, these organisational characteristics determine the aims, scope and mode of eCompetence programmes*.

In the case of individual practices, it is not always easy to distinguish between the suggested categories of competencies. For example, if new applications for educational technologies are developed, the distinction between pedagogical competency (the ability to create an educational concept) and technical competency (the ability to create or adapt software) can become blurred. However, the suggested distinction between different types of eCompetences can still be helpful. This becomes clear in the relation between basic computer skills and more general information literacy, where basic computer skills are a prerequisite, but not the same as information literacy, which in return would not be complete without a subset of technical skills.

The suggested categories also proved to be useful in combination with different levels of competencies. This concept makes it possible to realise that competences have to match circumstances, especially the social environment of an effective practice. For example, it would be wrong to ask for highly advanced online distance learning scenarios in an institution with traditional residential and classroom based education. It also is too optimistic to ask teachers for advanced blended learning scenarios if they still lack basic computer skills. And it can be quite useless to have very advanced programming skills if one lacks pedagogical competences, or the organisational environment to apply new tools and applications.

Based on our analysis, we want to conclude with the following recommendations to further progress eCompetence development programmes. First of all, we think it is necessary to highlight the importance of basic computer skills specifically, and of information literacy more generally. eCompetence does not start with the use of virtual learning environments. A good command of standard software applications has to be regarded as a basic cultural technique and is a prerequisite for competently dealing with digital forms of information. While it is necessary to acquire information literacy as a general competence, we think that it should be trained in the context of the specific discipline. In other words, it is possible to identify information literacy in general terms, but *it is necessary to apply and train these skills in the specific academic field.*

Secondly, we think *it is necessary to create a good balance between pedagogical, technological and organisational skills*. Problems or challenges that have been reported in the practice descriptions can often be explained as imbalances between these three aspects, e.g. when sophisticated technology is made available, but pedagogical uptake is lagging behind or organisational support is missing. In these cases, it makes sense to change the perspective from one aspect to another, e.g. to switch the focus from technical solutions to pedagogical or organisational considerations as a way to improve the efficiency and effectiveness of educational technologies.

A third conclusion is that educational technologies and eCompetences are in dynamic development. Therefore *it is necessary to prepare for permanent innovation rather than for a one-time change*, to plan for change rather than for stability. Both individuals and institutions have to face frequent needs to acquire new skills, while at the same time existing skills might lose their value. Permanent innovation also has economic and organisational consequences. Several practice descriptions mentioned the need to shift the economic basis for educational technologies from "seed" (or start-up) funding to sustainable funding. Since it cannot be expected that financial support for higher education in general will be increased, funding for educational technologies will have to come from a re-allocation of existing resources, from organisational re-arrangements, including shifts in workloads and changed roles.

The development of eCompetence is a major issue for the further improvement of the effectiveness and efficiency of higher education. As technologies become more and more part of our educational practice, eCompetences need priority in continuing professional development in higher education. We hope that our analysis framework and the analysis itself can contribute to the quality of eCompetence development programs.

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