

Rethinking Learning and Employment at a Time of Economic Uncertainty

**Proceedings of the 6th
TENCompetence Open Workshop**

Manchester, UK, 19th and 20th November 2009

Edited by David Griffiths and Rob Koper

Rethinking Learning and Employment at a Time of Economic Uncertainty

Proceedings of the 6th TENCompetence Open Workshop in
Manchester, UK, 19th and 20th November 2009

Editors: David Griffiths & Rob Koper

Published by The Institute for Educational Cybernetics, University of Bolton, 2010

ISBN 978-0-907311-30-0



These proceedings are licensed under a Creative Commons Attribution-Noncommercial- No
Derivative Works 2.0 UK: England & Wales License.

See <http://creativecommons.org/licenses/by-nc-nd/2.0/uk/> for details.

Members of the Programme Committee

Albert Anghern

Ambjörn Naeve

Bernard Scott

Davinia Hernández Leo

Gilbert Paquette

Griff Richards

Heidrun Allert

Henk Sligte

Josep Blat

Juan Manuel Doderó

Judith Schoonenboom

Kinshuk

Krassen Stefanov

Marcus Specht

Miguel Angel Sicilia Urbán

Miguel Arjona Villanueva

Oleg Liber

Peter Goodyear

Ralf Klamma

Roger Hartley

Ruud Lemmers

Introduction

For some years there has been an awareness that the pace of social, technical and economic change in a global environment requires increasing adaptability in businesses and organisations, and in the people who work in them. Knowledge and personal skills needed to be complemented with an ability to respond creatively to challenges and to work in groups and social networks which may be highly distributed. From this perspective traditional qualifications curricula and career structures are too rigid to be appropriate in the new conditions. Similarly methods of evaluation, personnel selection and human resources processes do not always correspond to the real requirements of today's jobs. Even if these issues were resolved, legacy technical systems can also make it very hard to adapt practice.

It was in response to this that the TENCompetence project was conceived to develop a free and standards compliant, open technical and organisational infrastructure to support lifelong competence development, and received four years funding, commencing in November 2006. With the rapid pace of social and technological change there is a danger that a lengthy project may no longer be relevant by the time that it has finished, but the current economic crisis has meant that flexibility and lifelong learning are no longer simply desirable goals, but rather essential factors in maintaining the viability of our economies and societies, and in ensuring a fulfilling work and social life for citizens.

It was this which led the Sixth Open Workshop organised by the project to be given the title *Rethinking Learning and Employment at a Time of Economic Uncertainty*. The workshop took place at the Manchester Conference Centre, UK, on the 17th and 19th of November 2007, and these proceedings provide a record of those papers which have successfully gone through the peer review process. All the papers discuss aspects of the contextualisation and provision of competence development activities, seen from strategic, pedagogic and technical perspectives.

The eight papers in this volume can be divided into three groups, as we now outline.

The first two papers discuss strategic issues related to the provision competence development activities.

Neumann and Oberhuemer discuss the way in which training methods can be selected in the context of a workplace which is a continuous process of transformation, and where workers are adapting to the circumstances of the market. They propose a decision curve which can support the design of competence development programmes by clarifying the choice of behaviouristic/cognitivist and the constructivist learning theories in different contexts.

Johnson, Griffiths and Hanslot consider the conditions for adoption of IMS Learning Design in face to face universities. They discuss the disruption caused to establish practice by the globalisation of the education market, and taking a small UK university as a case study they describe the way in which staff have responded to international expansion. They offer a unifying explanatory framework for the observed processes which makes use of Harré's Positioning Theory. It is proposed that 'universal disruptions' in an education institution, such as the internationalisation of the university, can provide the conditions where the priority to maximise the effectiveness of communications in the institution, the provision of good teaching and the coordination of a multi-national educational operation can be linked in such a way that IMS LD technology presents a natural solution both for teachers and educational

managers.

Papers three and four address aspects of the technical infrastructure required to provide flexible support for competence development.

Miao, Sloep and Koper focus on the technical support required for to enable competence development to be carried out in the context of work-based learning projects. They discuss approaches to building Business Process Models which can provide the basis for this, and conclude that IMS Learning Design can largely meet the requirements of this domain. The capabilities of the TENCompetence infrastructure for learning activities are discussed, and some concrete limitations of the IMS Learning Design specification identified.

The next paper, *Pérez-Sanagustín, Cherian, Hernández-Leo, Griffiths and Blat* also addresses a limitation in IMS LD infrastructure as regards competence development, in this case the lack of a mechanism whereby learners can execute a unit of learning without the intervention of a teacher or administrator. A solution to this problem developed within the TENCompetence project is described, together with a pilot implementation in an adult education centre in Barcelona.

The final four papers present the results of pilots which make use of TENCompetence tools to provide competence development opportunities in four contrasting contexts of lifelong learning, outside the traditional context of formal education.

Jonoski, Popescu and Keul describe the use of TENCompetence tooling in the context of UNESCO-IHE, an international academic institute dedicated to water-related postgraduate education, is facing new challenges in offering life long learning services and online educational support. Two competence based courses were developed, involving the redesign of existing topic-driven courses into a competence-based course. The paper discusses the implications of this for education design and support and ICT infrastructure, and provides the results of evaluation work.

Louys, Hernández-Leo, Sligte, Pérez-Sanagustín and Schoonenboom describe two pilot studies centred on technology enhanced competence development in lifelong education, carried out in the challenging context of the Association of Participants Àgora (also the site of the pilots reported in paper 4). This work builds on pilots with earlier versions of the TENCompetence infrastructure in the same location, offering the opportunity to compare different versions of the software. The paper introduces the context and the pilot scenario, indicates the evaluation methodology applied and discusses the most significant findings and compares the two pilot studies. The results of the pilot reported here reinforce earlier indications that TENCompetence provides a relevant solution for competence development in support of social inclusion.

Nikolova, Stefanov, Todorova, Stefanova, Ilieva, Sligte and Hernández-Leo report on pilot of the TENCompetence infrastructure in Bulgaria, working with adult learners who where enhancing their competences in aspects of traditional culture. The infrastructure was deployed to support the I*Teach didactical methodology developed in the frame of I*Teach Leonardo project. The results of the evaluation are compared with the conclusions of earlier pilots, and it is concluded that the ICT tools deployed and the didactical methodology used offer a strong support for teachers' professional development.

Santos, Carralero, Hernández-Leo and Blat analyse a pilot carried out at the Catalan cooperative Doblevia. The objective of the work was to improve the human resources

management infrastructure of the cooperative by introducing support for the lifelong competence development. The initial results reported here provide insight into the impact and benefits a competence based approach can have for an SME cooperative.

The publication of these proceedings constitutes the final act of the TENComptence project, but they do not mark the end of the program of research and development. The TENCompetence Foundation has now taken ownership of the code which has been developed in the course of the last four years' work, and publishes all this as freely available open source, available at www.tencompetence.org. The Foundation provides a focus for continued work by the community which has grown up around this work, and an opportunity for new people to join.

Finally, we would like to thank the programme committee whose efforts in reviewing submissions made the workshop possible, the organisers who ensured the smooth running of the event, and all those authors who committed their time and energy to sharing their research with the wider community through their participation. We would also like to thank Richard Millwood for his help in formatting these proceedings.

The Editors:

David Griffiths

Rob Koper

Table of Contents

The Decision Curve for Training Methods - How to Attain Competences in Workplace Learning?.....	1
Susanne Neumann and Petra Oberhuemer	
Positioning Learning Design: Learner Experience and the challenges of transforming teaching practice.....	11
Mark Johnson, David Griffiths and Zubair Hanslot	
Facilitating Work-based Learning Projects: A Business Process-oriented Knowledge Management Approach.....	22
Yongwu Miao, Peter Sloep and Rob Koper	
A tool for the auto-management of Units of Learning: the Link Tool.....	34
Mar Pérez-Sanagustín, Roy Cherian, Davinia Hernández-Leo, David Griffiths and Josep Blat	
Using TENCompetence tools: experiences from on line competence based learning in Hydroinformatics at UNESCO-IHE.....	44
Andreja Jonoski, Ioana Popescu and Carel Keul	
Enhancing competence development for social inclusion using the TENCompetence Web tools.....	60
Amélie Louys, Davinia Hernández-Leo, Henk W. Sligte, Mar Pérez-Sanagustín and Judith Schoonenboom	
TENCompetence tools and I*Teach methodology in action: development of an active web-based teachers' community	
Nikolina Nikolova, Krassen Stefanov, Cornelia Todorova, Eliza Stefanova, Miroslava Ilieva, Henk Sligte and Davinia Hernández-Leo	
Complementing the Human Resource Management infrastructure of the Doblevia cooperative using TENCompetence.....	85
Patricia Santos, Miguel-Angel Carralero, Davinia Hernández-Leo and Josep Blat	

The Decision Curve for Training Methods - How to Attain Competences in Workplace Learning?

Susanne Neumann and Petra Oberhuemer

University of Vienna
Center for Teaching and Learning
Porzellangasse 33a
1090 Vienna, Austria

email: susanne.neumann-heyer@univie.ac.at

Abstract. Competences have received increased attention over the past years. A question that may be posed in this regard is what types of training methods support the attainment of what types of competences? Because learning theories prescribe differing instructional setups, the corresponding training methods target different types of target competences. We distinguish here between Knowing What, Knowing How, and Reflection-in-Action competences. The article presents a decision curve that aids in choosing constructivist and behaviouristic/cognitivist-oriented training methods. The decision curve is then related to the requirements of workplace learning. We argue that constructivist training methods best support the informal learning that is common in corporate settings.

Keywords: Competence, Training, Method, Work, Corporate Learning, Instruction

1 Notions of Competence

*Competence*¹ has recently entered the vocabulary of trainers and educators in Europe. There is a wide array of definitions for competence.

- The American Heritage Dictionary states that a competence is “1a. the state or quality of being adequately or well qualified; ability [...] b. a specific range of skill, knowledge, or ability” (Competence, 1996, p. 385).
- In the Tuning project (2004), competences represent “a dynamic combination of cognitive and meta-cognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values”.
- The TENCompetence project, which focuses on supporting individuals, groups and organisations in lifelong competence development, states that a competence is “a necessary ability of an actor to act effectively and efficiently to cope with certain problems, events or tasks in a situation (an occupation, a hobby, a market, a sport, etc.)” (TENCompetence Project, 2006). They have further adapted a differentiation of five classes of competences as introduced by Cheetham and Chivers (2005): cognitive, functional, personal, ethical, and trans-/meta competences.
- Erpenbeck and von Rosenstiel (2003) define competence as the disposition to

¹ We understand that the community has been discussing a differentiation of the two terms competence and competency. We are not concerned with this differentiation. Rather we assume both terms to be covering related ideas and we will thus only refer to one of the terms, in this case, competence.

act in a self-regulated manner. Two types of competences to distinguish are self-regulation strategies with goal orientation (subject-methodical competences dominate), and self-regulation strategies with open goals (personal, social-communicative and activity-oriented competences dominate). Competences according to Erpenbeck and von Rosenstiel do not target a certain result, but relate to the disposition to show a performance.

The sample of competence definitions suggests that being competent refers to a range of knowledge, skills or abilities that a person could possess. What the definitions have in common is that a person has to have a certain qualitative level of knowledge and/or skill, and in some cases (the disposition) to apply knowledge and skill in specific situations. Our intention is not to argue for a better or worse definition of competence. We will accept that competences may relate to different forms of expressing knowledge and ability. For the purposes of this article, we distinguish between the following three groups of competences that could be mapped to the terms used above, and which represent a continuum that people move up when gaining experience in a field (Ertmer & Newby, 1993):

- *Knowing What* - is to recognise and apply standard rules, facts, and operations of a profession
- *Knowing How* - is to think like a professional, extrapolate from general rules to particular, problematic cases
- *Reflection-in-Action* - is to develop and test new forms of understanding and actions when familiar categories and ways of thinking fail.

The goal of this article is to take a closer look at how these types of competences could be related to training methods. The goal is to understand what types of training and learning methods support the attainment of different levels of competence and in relation to learners' current knowledge levels when considering a workplace learning context.

2 Learning Theories and Training Methods

In order to link competence attainment to training methods, we will first look at the foundation of training methods, i.e. learning theories. We then elaborate how training methods relate to learning theories.

2.1 Learning Theory Background

Three main learning theories are summarised here; please refer to Schunk (2000) for more elaborate descriptions. Behavioural theories explain learning in terms of environmental events and influences and view learning as a process of forming associations between stimuli in the environment and the corresponding responses of the individual. Reinforcement strengthens responses and increases the likelihood of another occurrence when the stimulus is present again.

Cognitivists extended the ideas put forth in behaviourism with information processing and mental models of learning. Cognitive learning theories explain learning in terms of changes in cognitive processes and the acquisition of mental representations (imagery). Two forms of cognitive learning approaches are discovery learning according to Bruner (learners obtain knowledge by forming and testing hypotheses) and meaningful reception learning according to Ausubel (learners relate new information to knowledge already in memory).

In a constructivist view on learning, the major change in approaching instruction is that learners are given access to knowledge in multiple ways, providing different contexts that knowledge can be constructed from. The focus is thus drawn away from the mere delivery of instruction towards the use of materials that involve learners, giving them a chance to actively participate through manipulation of or social interaction about these materials. In this process, learners are taught to be self-regulated and take an active role by setting own learning goals, monitor and evaluate their own learning progress, and ideally go beyond predefined requirements by exploring their own interests (Bruning et al., Geary cited in Schunk, 2000).

Behaviourism and cognitivism, although having fundamentally different assumptions about the learner's role, nevertheless arrive at similar conclusions for the setup of training and learning environments (Ertmer & Newby, 1993). Both theories advocate the provision of knowledge blocks that are (pre)arranged and decomposed, and that are often detached from their original context. Also, the fundamental philosophical approach of behaviourism and cognitivism to map the world onto the learners is identical. We will thus (for the purposes of this article) conceptually join these two theories. We then use the joint concept behaviourism/cognitivism for comparison against constructivism in latter portions of this article. This simplification serves to make differences more apparent and to reach an understanding where training methods serve one or the other type of learning theory more.

2.2 *Training Methods*

In this subsection, we associate training methods with the two groups of learning theories. Training methods do not necessarily exhibit concrete signs that uniquely relate them to a learning theory. However, recognising aspects of learning theories behind a training method can be achieved by comparing the arrangement and types of activities prescribed by the training method with the instructional principles advocated by a learning theory. Also, for some of the training methods, the theoretical origin of development is known. Problem-based learning, for instance, has its roots in constructivist learning (Savery & Duffy, 1995). Programmed instruction has its roots in behaviourism (Schunk, 2000). Table 1 lists sample training methods, which are taken from a list of popular corporate training methods (Kaupins, 1997). For each training method, the attribution to either the behaviouristic/cognitivist paradigm (short: B/C), or the constructivist paradigm (short: CS) is suggested.

Training methods are not necessarily limited to those in which a trainer sets up training for learners. In our understanding, training methods may just as well include methods that learners choose, set up, and implement themselves. Learners may not always be aware of carrying out this procedure (for instance, when approaching a colleague with a problem they have encountered), but they are in fact using common training methods unconsciously.

3 **Decision Curve for Choosing Types of Training Methods**

3.1 *Influencing Factors*

Learning processes change in nature and diversity as learning progresses (Shuell cited in Ertmer & Newby, 1993). The question of what training method to use does in fact not only relate to the level of competence to be attained, but also relates to the learner's current level of knowledge. Therefore, at different stages in the learning

The Decision Curve for Training Methods - How to Attain Competences in Workplace Learning?

process, and for different goals, different training and learning methods are appropriate. When deciding on a type of training method (based on a learning theory background), the designer has to consider the current level of learners' knowledge and the target type of competence.

Table 1: Associating training methods with learning theories.

Method	Short Description	Association with learning theory and rationale
Case study	A case derived from a realistic context with structured content of reduced complexity is used to primarily train decision-making skills.	Constructivist (CS): Task is derived from authentic context, learners have ownership of the task, often social negotiation.
Apprenticeship	As specified in a learning contract, the trainee follows the trainer around the workplace, where the trainer demonstrates and the trainee practices. At the end, accuracy and adequacy of the trainee's performance are determined.	The attribution could be made to either. Behaviouristic/Cognitivist (B/C) is attributed if imitation prevails. CS is attributed if responsibility is shifted to learner as competence increases.
Lecture/ Presentation	The trainer explains the concepts or theory behind concepts or processes to be learned. Learners listen and ask questions.	B/C: Information is decomposed and prearranged. Learners map knowledge into their understanding.
(Peer) Discussion	Learners analyse main points as well as new information regarding an issue, and appraise them with peer input.	CS: social negotiation, based on learners' experiences; multiple perspectives.
Self-study programme	Learners individually work through (web)sites presenting information. Typically, they take a pre-test, then read and practice, and take a post-test.	B/C: Information is preconfigured and arranged. Testing is often done according to correct/not correct principles (automated testing).

3.2 The Decision Curve

The choice, which training method to use in a particular training situation, depends on a number of factors. For the decision curve presented herein, these factors were limited to two: the learner's current knowledge level, and target type of competence. The resulting curve is to be regarded as a general guide that suggests a tendency, and which does not allow precise decision-making for particularities of specific training situations.

The choice of when to use what method is demonstrated in Figure 1. The horizontal

axis depicts the increasing types of competence levels that learners may attain. For this axis, the instructional designer has to choose where the target competence fits. On the vertical axis, the learner's current level of expertise in the subject area at hand is scaled from low to high. When looking at intersections of target types of competence and the current level of expertise, a trend towards using training methods of the behaviouristic/cognitivist paradigm or constructivist paradigm can be spotted. The dashed line indicates where the cut-off between a decision for one or the other training method orientation should approximately be drawn.

Person's current level of expertise in the work/subject area

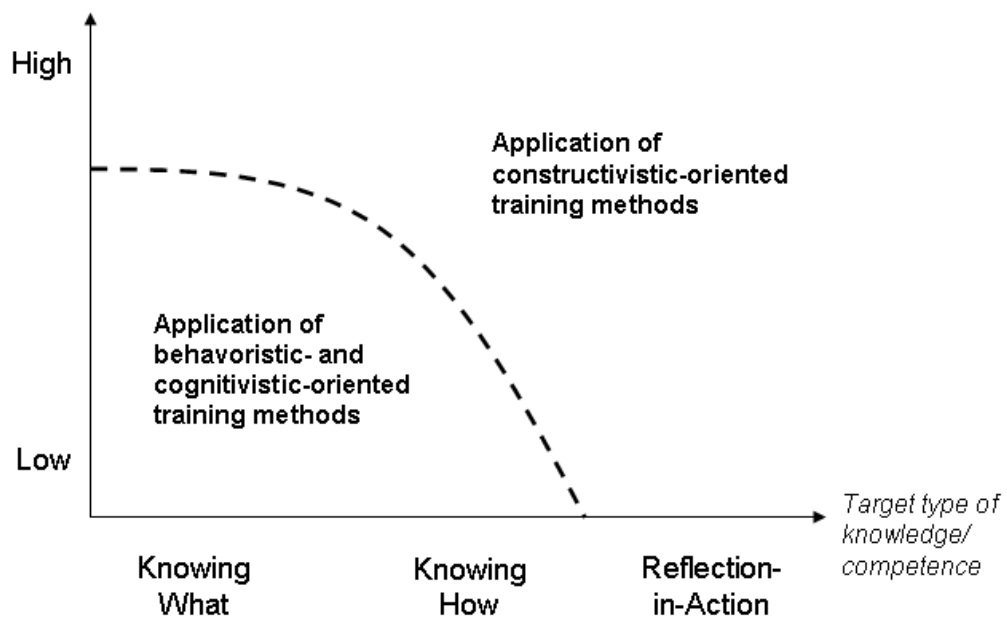


Figure 1: Types of training methods to be used according to different levels of competence achievement and according to the current levels of a learner's knowledge.

Generally, the higher the target type of competence, and the higher the learner's current level of expertise in the subject area, the higher also is the chance that constructivist-oriented training methods should be used for learning. This also means that the use of constructivist-oriented training methods, which at times demand more preparatory time and involvement by learners and trainers, is not the best choice when novice learners are trained in Knowing What or Knowing How types of competences.

In some cases, the decision for a type of training method appears to be straightforward, e.g. when pairing Knowing What with lower levels of current knowledge. In other cases, the choice is not as obvious, e.g. when targeting Knowing How with medium levels of current knowledge. The instructional designer should then decide based on the actual goal: How much will the learner have to depend on improvisation in the task? How much of the information or processes to be learned are already known or standardised? The likelihood of choosing behaviouristic/cognitivist methods rises, when the target knowledge follows algorithmic patterns; the chance for choosing constructivist methods rises, when situations are unpredictable and task demands are bound to change.

When targeting Reflection-in-Action, a type of competence where the current understanding of approaching a problem reaches its limits, learners will not succeed on behaviouristic- and cognitivist-oriented training methods (Ertmer & Newby, 1993). Training methods that are based on behaviourism and cognitivism strive for an optimal representation of knowledge blocks to support efficient learning. When knowledge to be learned cannot be clearly specified, then constructivist training methods should be used. Remember that learners may self-initiate learning using particular training methods without the presence of a trainer.

One conflict that this curve creates is when learners with low levels of current knowledge in the expertise area are to attain Reflection-in-Action competences. The question is whether a novice is capable of moving directly from little knowledge in the domain to a Reflection-in-Action competence, or whether novices have to first move through the Knowing What and Knowing How stages to arrive at Reflection-in-Action. Depending on the underlying philosophical approach, one recommendation could be to move through the lower types of competences towards Reflection-in-Action (B/C approach). Another suggestion could be to immediately target the Reflection-in-Action competence using constructivist training methods but to simultaneously present lots of scaffolding instruments and guidance during the learning process (CS approach). Scaffolding is essential in this case, because learners experience high loads on their working memory when facing highly complex environments and tasks for the first time (Kirschner, Sweller & Clark, 2006).

3.3 Empirical Support for the Presented Curve

Aptitude-treatment interaction studies examine effects of learner aptitudes and traits on instructional methods. This body of studies showed an expertise reversal effect, where instructional methods that are effective for novices become less effective as the expertise increases (Cronbach & Snow cited in Kirschner et al., 2006). Kirschner et al. further state that, “controlled experiments almost uniformly indicate that when dealing with novel information, learners should be explicitly shown what to do and how to do it” (Kirschner et al., 2006, p. 79). This is support for using behaviouristic/cognitivist training methods for lower types of competences where they are coupled with low current levels of expertise. It also supports the scaffolding methods that are often part of constructivist-oriented training for novice learners.

When learners have sufficiently high prior knowledge, they require less guidance: “The more autonomous the learner, the less need there is for structure from the instructor” (Nelson, 1999, p. 248), and “strong treatments [highly structured instructional presentations] benefited less able learners and weaker treatments [relatively unstructured and less learning support] benefited more able learners” (Kirschner et al., 2006, p. 81). This is represented in the decision curve by recommending the use of constructivist training methods for advanced learners because task ownership and self-regulation are concepts supported in constructivist methods.

Oracle Corporation trainer Michael Feldstein states that he will listen to his clients’ needs when choosing methods for training. Feldstein recognises the following tendencies when selecting training methods: For senior or highly experienced employees receiving specialised training, he chooses constructivist methods (Feldstein, 2004). When he is training advanced learners in company skills that are somewhat predefined or standardised, he uses cognitivist methods; and where “imitation is sufficient and innovation is generally seen as a negative”, he uses behaviouristic methods (Feldstein, 2004).

4 What Does the Decision Curve Mean for Workplace Learning?

4.1 Characteristics of Workplace Learning

In corporate training, pure knowledge acquisition (Knowing What) as an instructional goal is the exception (Lehner, 2004). Companies usually place focus on employees acquiring competences that enable its possessor to act (Erpenbeck cited in Lehner, 2004). For the terminology adopted in this article, we could state that corporate learning usually targets Knowing How and Reflection-in-Action competences.

Workers have reported that formal² and non-formal³ training are seen as useful but this type of training is often less specific to the tasks workers perform (Gerber, 1998; Sachs, 1995). New approaches to corporate training thus see informal learning⁴ as the most important setting for continuous learning required in the workplace (Rubenson & Schütze, 1993). It has further been shown that formal and non-formal training are not necessarily needed in order to achieve conceptual understanding: Workers learn about the concepts while working with them in the workplace (Scribner & Sachs, 1990). The importance placed on informal learning at the workplace is based on the premise (and change in theoretical perspective) that competences do in fact not exist independently of the situation in which they were acquired (Rubenson & Schütze, 1993).

Self-regulated learning, which highly relates to informal learning, plays a dominant role in workplace learning (Erpenbeck & von Rosenstiel, 2003). Workers report that they self-organise learning in regard to the tasks they have to perform, and in collaboration with fellow workers using peer teaching and discussion (Sachs, 1995). In order for adult learners to become self-directed and self-regulated, it is not enough to tell workers what to do and what to learn (Portway & Lane, 1997) as would be the case when using behaviouristic/cognitivist training methods. During early phases of knowledge acquisition, however, using lectures and highly structured learning materials as training methods may be appropriate (Portway & Lane, 1997).

4.2 Mapping the Decision Curve to Workplace Learning

The dashed line in Figure 1 does not only represent a division between behaviouristic/cognitivist and constructivist training methods. Rather, we see that this division could also represent a distinction between formally organised training and informal learning. Since behaviouristic- and cognitivist-oriented training methods present the learner with decomposed and decontextualised learning experiences, we could set up the hypothesis that informal learning in the workplace matches well to the principles of constructivism, which foster context-driven learning, learners' self-regulation and (learning) task ownership. We also see a link between informal learning and Reflection-in-Action types of competences: To develop and test new forms of understanding and new ways of thinking is not possible with behaviouristic/cognitivist training methods. Rubenson and Schütze (1993) state in

² Formal training is defined as professionally organised training within a defined curriculum or programme in order to reach a qualification or credentials (Gerber, 1998).

³ Non-formal training is here defined as systematic instruction provided on an infrequent basis (Gerber, 1998).

⁴ Informal education is defined as learning from experience by working on tasks at the workplace (Gerber, 1998).

this regard that modern workplace qualifications cannot be acquired in specialised skill training sessions using traditional methods. Learning directly at the workplace (as opposed to a classroom-like setting), however, should be predominant, resulting in a close integration of work and learning. Constructivist training methods seem to best support this integration.

5 Conclusion

This article proposed a decision curve that guides choosing training methods based on behaviouristic/cognitivist, and the constructivist learning theories. We suggested that assumptions of behaviouristic theories do not translate well into learning within corporate organisations (Engeström, 2001). Workplace learning is driven by the circumstance that companies are in a continuous process of transformation, which in turn requires continuous updates of workers' competences (cp. Schön, 1983). Job requirements, as they are commonly used in companies, may thus be an outdated concept, since these assume that the skills a worker has to perform are acquired in training and then applied in work (Rubenson & Schütze, 1993). This vision regards skills and work as having a static relationship, where skills that were once learned during a limited period of training are applied steadily throughout a working career (Rubenson & Schütze, 1993). Reality shows that this relationship is in fact more dynamic. The current trend to move away from "skills" and towards the concept of "competence" or "qualification" (mainly used in German-speaking countries) reflects the need not just to observe the mastery of a technique, but at the same time consider a person's background, orientation and capacities, taking into account the "intimate interaction between the acquisition and the application of human capacities" (Rubenson & Schütze, 1993, p. 104).

The idea of stable states is not valid in corporate learning settings. Instead, workplace learning has to be seen as a continuous process of transformation, where workers adapt to changing circumstances in the market, and thus, changes in their job requirements. Informal learning is the backbone of this transformation. In this sense, we conclude that constructivist-oriented training and learning methods should play a dominant role in corporate learning. Constructivist training methods with its main principles of active and authentic learning, multiple perspectives and collaborative learning (Karagiorgi & Symeou, 2005) best allow workers to solve problems regarding the tasks they are performing.

Acknowledgement. This article was written in the context of the research and development project PROLIX, which is co-funded by the European Commission in the Sixth Framework Programme "Information Society Technologies".

References

- Cheetham, G., & Chivers, G. (2005). *Professions, Competence And Informal Learning: The Nature of Professions and the Role of Informal Learning in Acquiring Professional Competence*. Cheltenham: Edward Elgar.
- Competence. (1996). *The American Heritage Dictionary of the English Language* (p. 385, 3rd ed.). Boston and New York: Jonathan P. Latimer.
- Engeström, Y. (2001). Expansive Learning at Work: toward an activity theoretical reconceptualisation. *Journal of Education and Work*, 14(1), 133-156.
- Erpenbeck, J., & von Rosenstiel, L. (Eds.). (2003). *Handbuch Kompetenzmessung:*

- Erkennen, verstehen und bewerten von Kompetenzen in der betrieblichen, pädagogischen und psychologischen Praxis.* Stuttgart: Schäffer-Poeschel.
- Ertmer, P. A., & Newby, T. J. (1993). Behaviorism, Cognitivism, Constructivism: Comparing Critical Features from an Instructional Design Perspective. *Performance Improvement Quarterly*, 6(4), 50-72.
- Feldstein, M. (2004). Constructivism, Cognitivism, and Behaviorism in the Corporate World. Retrieved September 14, 2009, from http://mfeldstein.com/constructivism_cognitivism_and_behaviorism_in_the_corporate_world/
- Gerber, R. (1998). How do workers learn in their work? *The Learning Organization*, 5(4), 168-175.
- Karagiorgi, Y., & Symeou, L. (2005). Translating Constructivism into Instructional Design: Potential and Limitations. *Educational Technology & Society*, 8(1), 17-27.
- Kaupins, G. (1997). Trainer opinions of popular corporate training methods. *Journal of Education for Business*, 73, 5-8.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, 41(2), 75-86.
- Lehner, M. (2004). Didaktik des E-Learnings - exemplarische Leitlinien. In M. Lehner & F. Fredersdorf (Eds.), *E-Learning und Didaktik: Perspektiven für die betriebliche Bildung* (pp. 31-44). Düsseldorf: Symposium Publishing.
- Nelson, L. M. (1999). Collaborative Problem Solving. In C. M. Reigeluth (Ed.), *Instructional-Design Theories and Models: A New Paradigm of Instructional Theory* (Vol. II, pp. 241-267). Mahwah, NJ: Lawrence Erlbaum.
- Portway, P. S., & Lane, C. (1997). Corporate Training. In P. S. Portway & C. Lane (Eds.), *A Technical Guide to Teleconferencing and Distance Learning* (3rd ed., Vol. 2009): Applied Business Telecommunication.
- Rubenson, K., & Schütze, H. G. (1993). Learning at and through the Workplace: A Review of Participation and Adult Learning Theory. In D. Hirsch & D. A. Wagner (Eds.), *What Makes Workers Learn: The Role of Incentives in Workplace Education and Training* (pp. 99-121). Philadelphia: National Center on Adult Literacy.
- Sachs, P. (1995). Transforming Work: Collaboration, Learning, and Design. *Communications of the ACM*, 38(9), 36-44.
- Savery, J. R., & Duffy, T. M. (1995). Problem Based Learning: An instructional model and its constructivist framework. *Educational Technology*, 35, 31-38.
- Schön, D. (1983). *The Reflective Practitioner - How professionals think in action.* London: Temple Smith.
- Schunk, D. H. (2000). *Learning Theories: An Educational Perspective* (3 ed.). Upper Saddle River, NJ: Prentice Hall.
- Scribner, S., & Sachs, P. (1990). *A case study of on-the-job training: National Center on Education and the Economy.*
- TENCompetence Project. (2006). *The TENCompetence Personal Competence Manager V1.0.* Retrieved October 12, 2009, from <http://www.tencompetence.org/node/96>

The Decision Curve for Training Methods - How to Attain Competences in Workplace Learning?

Tuning Project. (2004). *Competences*. Retrieved October 12, 2009, from <http://www.tuning.unideusto.org/tuningeu/index.php?option=content&task=view&id=173&Itemid=209>

Positioning Learning Design: Learner Experience and the challenges of transforming teaching practice

Mark Johnson, David Griffiths and Zubair Hanslot

The University of Bolton, Deane Road, Bolton, BL3 5AB, UK

email: m.w.johnson@bolton.ac.uk

Abstract - Whilst IMS Learning Design has advanced in its technological implementation in recent years, the adoption of teaching practices relating to the online coordination of learning activities has been slow. In this paper, we argue that the focus on activity rather than content - implicit in the approach of learning design technologies - amounts to a significant shift in teaching practice in Universities. In this paper, we seek to understand what a shift to teaching through designing and coordinating activities might mean, the challenges it presents, and the ways in which teaching practices which embrace this might be developed.

We report on the disruption to teaching practice caused by the international expansion of a UK university. Drawing on outcomes observed both through general staff responses to the expansion, as well as through responses to a specific learning activity designed to raise awareness of pedagogic and organisational issues, we construct a unifying explanatory framework which situates the role of activity coordination in the experiences identified. Our model draws on previous work related to the adoption of new technological practices, and on the Positioning Theory of Harré. We argue that this model can also serve to identify the necessary conditions for the successful adoption of IMS Learning Design (LD) technologies and practices. In particular, we highlight the fact that ‘universal disruptions’, such as the internationalisation of the university, can provide the conditions where the priority to maximise the effectiveness of communications in the institution, the provision of good teaching and the coordination of a multi-national educational operation can be linked in such a way that IMS LD technology presents a natural solution both for teachers and educational managers.

Keywords: Learning Design, conditions for adoption, Positioning Theory, disruption, globalisation.

1 Introduction

Emerging from Koper’s (2001) work on the Educational Modelling language, there have been significant advances in the use of IMS Learning Design (LD)⁵ to support the online coordination of learning activities (for example, Recourse (2010), CopperCore (2008), SLED (2010) and Astro(2010)). However, impact on the practice of teachers with this technology has yet to be clearly established. Nevertheless, the online coordination of learning activity can be seen as strategically important for institutions as they seek to adapt to the challenges of increased personalisation and work-focused learning on the one hand, and globalisation and transnational education on the other. This paper

⁵ <http://www.imsglobal.org/learningdesign>

attempts to gain a deeper insight into this state of affairs through an analysis of the globalisation of a UK University. We report on two broad types of outcomes that have been observed by different stakeholder groups as the University has engaged in the establishment of a new campus in the Middle East. The first set of outcomes reflect the broad impact on teachers, managers and learners of the globalisation programme. The second set of outcomes reflect the results of a small-scale international learning activity conducted simultaneously with teachers in the UK and abroad. In an approach based on Realistic Evaluation (Pawson and Tilley, 2002), our purpose in identifying these two sets of outcomes is to consider a possible mechanism which might explain the observed phenomena in each case.

The uptake of any technology involves changes to the practice of teachers and learners, and this change in practice is often difficult to establish. In developing our analysis, we aim to construct a model of the possible conditions for the adoption of IMS-LD technologies. To achieve this, we draw on models derived from previous work on the JISC-funded SPLICE project (JISC, 2009) and from Harré's Positioning Theory. The SPLICE project focused on modelling the conditions for changes to technological and teaching practice, focusing on attempts to instil technological habits with social software. Harré's Positioning Theory concerns the different ways in which individuals relate to one another. SPLICE forms the basis of our explanatory mechanisms for the outcomes reported here, and we develop these mechanisms to articulate the place of IMS-LD technology within the current conditions of higher education in a globalised environment.

2 The context for investigation

Like many universities, the University of Bolton has been active in addressing the needs of new groups of learners in the UK and abroad. Initiatives in work-based learning building on the work of the Ultraversity project (Powell, Tindal & Millwood, 2008), lifelong learning and widening participation have sought to address the demands of increasingly personalised learning needs. Adapting its provision for learners abroad has led to the establishment of satellite campuses delivering UK qualifications. These innovations have been conducted against the background of increasing financial uncertainty for universities as the burden of funding Higher Education in the UK shifts from central government to learners and external partners.

The demands of personal work-focused curricula, the widening of access to University to a broader group of potential students, and the demands of globalised courses have meant that the individual learning contexts that learners find themselves in are becoming increasingly disparate. This presents challenges for teachers who once relied on a group of learners being in the same context (for example, a classroom) where their learning could be easily coordinated through a combination of the design of lessons and resources, as well as the ability of the teacher to coordinate classes reactively so they could respond to individual differences and needs. Disparate and fractured individual learning contexts inevitably entail a reduced capacity for the teacher to coordinate and react to learning activities amongst a group of learners. This means that the design and planning of those activities becomes more important. It is to address this need that we argue the technologies around IMS-LD are relevant to the challenges of globalisation. However, shifting teachers from practices which have predominantly been based around class-based coordination to activity design has presented some significant cultural challenges in the institution.

3 Divided opinion on the internationalisation of the University

The University of Bolton has been predominantly a face-to-face university where teaching and learning is often conducted on a relatively small-scale in classroom settings. In this setting, learner experiences depended largely on the interpretation of syllabus content by individual teachers who are also responsible for conducting assessments. From this single-context situation, the University's internationalisation has meant that the learning experiences of home learners have to be reproduced overseas in other classroom contexts conducted by local teachers. With quality procedures controlled from Bolton, and in particular by the UK-based module leaders, the probability of misinterpretation between teachers and learners in different cultural contexts is high. The result has been the creation of a disruption for many teachers in the UK campus for whom teaching practice had previously been unproblematic.

This disruption to staff practice has produced a variety of responses across the institution. These have been recorded in surveys of opinion and reports as the project has progressed. Managers observed pockets of resistance to the internationalisation programme amongst some staff, whilst other staff embraced the opportunity to engage in something that was perceived to be new and exciting. These contrasting attitudes manifested themselves in the ways communications with staff in the new campuses was conducted.

A basic analysis of these communications is revealing. Staff in the new campus were initially sent the official module specifications and some sample teaching resources. These detailed the broad subject area, and the means of assessment. However, much of the syllabus content is open to interpretation. For those UK-based staff who enthusiastically engaged in the developments, richer communications were provided to the overseas partners which gave an insight into how the module was actually delivered and assessed in the UK. Staff who were less enthusiastic about the initiatives tended to highlight the formal requirements of the module without giving much 'personal' information about how it was actually run in the UK. This sometimes led to confusion and misunderstanding between the home and overseas campuses.

Groups of teachers reported different opinions concerning the international operation. Some felt that decisions has been taken which directly affected their teaching practice without their consultation. As a result, within this group, there was little buy-in initially to the project. Other staff saw opportunities in the plans and were amongst an early group of staff to visit the new campus. Such visits significantly swung attitudes amongst those staff in favour of the developments.

These outcomes reflect the disruption that the internationalisation of the university caused. The new campus was talked about, whether from a positive or a negative standpoint. The university sought various means to harness this conversation and engage staff in a deeper examination of current teaching practices and their efficacy in the fast-changing educational sector. This examination was particularly focused on teacher-learner and teacher-teacher relationships, and online engagement particularly across cultural and national boundaries. One activity, which we report now, was conducted with a broad group of staff who represented the broad spectrum of opinion. The outcomes revealed by this activity shed light on the role of online activity design for dealing with learners and teachers in disparate contexts.

4 An activity to explore the challenges of international engagement

A computer-coordinated staff development activity sequence was designed to simulate collaboration between three ‘campuses’. The purpose was to expose the problems overseas learners and teachers have in studying in a context where their local teachers rely on communication from teachers in the UK as to how and what to teach and assess.

In the execution of this activity, the three campuses were created by dividing UK staff into two groups (in separate rooms) and a third group comprising teachers in the overseas campus. The activity, which is intended to be discipline-neutral, involves the creation of an ‘animal’ sculpture from tin foil. Each ‘campus’ elects a ‘teacher’ who is instructed on how to guide the ‘learners’ through the activity. Each ‘campus’ is instructed in different ways on how to conduct the activity, with one campus receiving video instruction, another paper-based instruction and the third email support. The sequence of activities is:

1. Choose a teacher
2. Teacher receives instructions
3. Teacher teaches ‘lesson’
4. Teacher assesses ‘results’
5. Results are ‘moderated’ by a ‘central examining authority’
6. Plenary discussion

Since the activity is delivered synchronously, the sequence can be coordinated using a video which is played simultaneously on each of the ‘campuses’. The plenary discussion uses Twitter as a medium for capturing the reflections of participants at the end of the session.

In running the activity with a group of 30 staff (20 in the UK), participants found this to be an amusing and (sometimes) frustrating experience. For those groups who received support in the form of paper instructions, or email (which was sometimes unreliable!), both the ‘teacher’ and the ‘students’ were left feeling bewildered by what was expected of them. The group with the video instructions (unsurprisingly) felt most supported.

These first impressions were supported by Twitter discussions in the plenary stage of the activity. Typical comments highlight that “transparency of assessment and the design of learning materials” and “feedback to correct mistakes” is of crucial importance for the success of the activity. The use of video was seen as particularly important. A complaint that “the central ‘assessor’ had a different idea of what the criteria were from the students” or “we didn’t know what the end product was meant to be” reflect the difficulties experienced at the ‘campuses’ where the teacher received their instructions via text (either paper or email). Talk of transparency of assessment and communicative media for revealing an understanding naturally led to a broader discussion of how this might be achieved. Overall, through the activity, staff are given an insight into the challenges of international delivery, and also an insight into the importance of engaging in communication practices which reveal their understanding. The exercise has run with positive evaluations with staff reporting that they not only enjoyed the activity, but that the result of their engagement would help change their practice.

5 Towards an explanatory mechanism: What's in an activity?

Our contention in this paper is that the broad outcomes reflecting the opposing views of teachers towards the international developments, and the specific outcomes concerning the staff development activity can be explained within a unified explanatory framework. At the heart of this framework, we argue, is the role of 'activity' in teaching and learning. In the outcomes concerning the staff development activity, the extent to which participants were able to form their own conclusions about communication across campus may be a factor in their expressed enthusiasm for the activity and increased insight into the problems it addressed.

The efficacy of learning activities in affording the freedom to explore and reach personal conclusions, as opposed to being 'told' what to do or think, was explored during the SPLICE project. In its concern for the ways in which new technological practices are adopted, the communications between learners and teachers were studied. This identified the differences in the way new practices were communicated. Teachers who modelled new practice themselves could suggest to learners "this works for me", opening themselves up for questioning by learners. This seemed to have greater effect than those teachers who either simply told their learners about new practices, or made them engage with them when they themselves remained unconvinced. SPLICE made the distinction between these different ways of communicating as the difference between 'disruption', 'coercion' and 'exhortation' (Johnson et al, 2009; Johnson and Sherlock, 2009). SPLICE identified that the activities involving teachers who modelled practice allowed for an exploratory activity which balanced disruption, coercion and exhortation of new practice, whereas activities involving teachers who didn't model practice tended to be more coercive or exhortative in nature.

These SPLICE distinctions provide a possible link between the outcomes concerning general opinion towards internationalisation and the outcomes from the learning activity. The learning activity was designed to allow staff to experience the difficulties of communication in international settings, and to conclude that effective use of technology (particularly video) was important in ensuring effective operation between the campuses. However, there was no specific 'exhortation' to use video. Instead, the activity provided a way of getting this across through balancing disruption (throwing participants into strange situations) with elements of exhortation and coercion as the activity progresses. Many of the participants in this activity had previously been subjected to other exhortations and coercions concerning the international project. But these interventions often exacerbated existing opinions. Thus in identifying a mechanism which might link the formation of general opinion to the experience of the learning activity, the role of activity in providing a context for exploration, and avoiding explicit exhortation or coercion seems to be significant.

This is borne out by the fact that the participants on the activity were all practising teachers, many of whom had experienced difficulties in trying to manage modules with teachers overseas. As with all dedicated professionals, exhorting or coercing a change in practice could be seen as an implicit criticism of the practices which they have developed and invested considerable effort in over many years. The activity was a way of addressing these serious issues without asserting authority, but instead allowing for the emergence of an understanding between staff that under the conditions of the exercise (and consequently the conditions of the international campus), certain practices were more effective than others.

In studying similar situations, the SPLICE project outcomes suggested that the effect of learning activities is one of changing the ‘positioning’ between the teacher and the learner. From positioning the teacher as ‘sage on the stage’ (King, 1993), where exhortation and coercion can dominate, to the teacher as “guide on the side” or even as a “co-learner”, where a finer balance between exhortation, coercion and disruption is possible. However, the issue of widespread changes in practice is more involved than the interaction between teachers and learners in a learning activity. However inspiring a particular activity is, real change requires a reorganisation of daily practice and personal priorities. In understanding the possible conditions for adoption of LD technology, we have to consider the conditions where:

- a. Teachers see that there’s ‘something in it for them’ to engage in learning design practices
- b. Institutions create teaching and learning policies which promote activity design and coordination technologies over those technologies which predominantly deliver content .

6 Social Context and Individual Practice

The relationship between individual practice and social context (or social structure) has been the topic of much debate in sociology for many years, with varying descriptions ranging from Giddens’s Structuration theory (1984) to Bhaskar’s Transformational Model of Social Activity (1977). Within these models, the transformation of technological practice is a form of social transformation which must consider aspects relating both to individual agency and social structure. In SPLICE, this was interpreted through creating a model whereby individual technological practice transforms the social context within which the individual operates, leading to the transformed social context conditioning further individual technological practice (Johnson and Sherlock, 2009). If new technological practice did not transform the social context, then the practice tended not to be sustained. Put more simply, the structure-agency distinction helps to describe more formally that people change their practice when they see there’s something “in it for them” to change.

Bearing this in mind, widespread adoption of LD technology similarly requires that teachers see that there’s something ‘in it for them’ to turn into online activity designers. Where the social context of teachers promotes and recognises the value of the technology, it is more likely to happen. However, in traditional institutions with a face-to-face history, this transformation of context is difficult to establish.

The structure-agency distinction features to a limited extent in Rogers work on the diffusion of innovation. In particular, the distinction between ‘optional innovation decisions’, ‘collective innovation decisions’ and ‘authority innovation decisions’ (Rogers and Everett, 1964), reflect the different balances between individual agency and the social structures within which individuals operate. However, Johnson and Davies (2007) have argued that Roger’s view of adoption tends to be from an outside observer’s perspective, and can be less useful in understanding the real causal mechanisms of change from the perspective of stakeholders directly involved in it. The metaphor of disruption, coercion and exhortation specifically attempts to identify the causal mechanisms of change in practice. Disruption, in particular, has been recognised to play a major role in the diffusion of innovation (Christensen et al, 2006). For example, the internet and mobile phones disrupted communicative practice in a way which left few untouched across many different communities of practice. New practices emerged in a many aspects of personal life as a result of this disruption,

often resulting in new policies within business practice which embraced technology (coercion), together with exhortations of the 'dot.com' era. The university's response to the changing context was the VLE. Given the importance that this suggests for the disruption of communities of practice, this raises an important question concerning the adoption of LD: "Is there a disruption to daily practice where the solution is Learning Design technology?"

However, the disruption of many communities of practice at once - which was the effect of the internet - may not be easy to effect with a technological disruption at the end of the first decade of the 21st century as it was in the last decade of the 20th. Since the technological disruptions of the 1990s and early 2000s, a process of technological personalisation has taken place which has given individuals enormous (and sometimes bewildering) choice about the technologies they might use for their teaching (Wilson, 2006). This has prompted many to cite the 'death' of the VLE (Styles, 2007), as personal technology takes over. Irrespective of whether the VLE is 'dead' or not, the upshot of personalisation is the fragmentation of the technology community where a single technology cannot disrupt everyone in the same way. Innovations instead tend to target particular interest groups: for example, users of Facebook, iPhones, Twitter, etc. Thus, unlike the 1990s, a technological intervention on its own is unlikely to provide a universal disruption of practice across a number of communities. Therefore, it is likely that if 'a disruption to which the solution is LD technology' is possible, this disruption will be caused by something other than technology itself.

7 Understanding and communication in a globalised world

Globalisation, although a phenomenon that pre-dates the technological explosion of the late 20th century (Osterhammel, 2003), has clearly been accelerated by technology in recent years. Without the communicative potential of the internet, the coordination of multi-national organisations would be impossible. Universities are increasingly subject to the forces of globalisation, as many seek to expand international provision, and some private institutions in the UK are being bought-up by multinational corporate concerns. As the example of the international expansion of the UK university shows, these challenges present fundamental communicative problems, as the coordination of activities takes place by proxy and at a distance. Globalisation, therefore, might provide a possible breeding ground for a disruption which will affect many communities of practice in the coming years. If this is the case, to what extent might LD technology be seen as a solution to these challenges in education?

As the Bolton experience has demonstrated, the communicative challenges of a global educational operation relate to finding ways of exploring understanding across different cultural contexts, where each participant can take ownership of the understanding that they reach, whilst mutual understanding of each party can be attained. The alternatives to activity design for creating mutual understanding are the traditional methods of teaching, which inevitably position the teacher as an authority where understanding is either coerced or a view exhorted. For staff on the overseas campus of Bolton who were on the receiving end of this traditional approach, the experience was reported as being 'alienating'. They felt they had no say and no control in what they were being asked to do, and yet they were skilled and knowledgeable professionals themselves. Similar feelings of alienation were also reported by overseas learners who were also at the receiving end of coercive practices which they felt they could not engage with properly.

The small-scale Bolton staff development activity could be seen as demonstrating the possibility for finding a different ‘way’ of helping stakeholders reach shared understandings. Given this, a focus on designing learning activities for creating shared understanding across different cultural contexts might deliver greater coordination between stakeholders in those different contexts. However, while we may claim that activities might allow for a richer mix of disruption, coercion and exhortation, this may not go far enough to convince practitioners that there’s something ‘in it for them’ to change their practice. To make this argument more powerfully a deeper understanding is required of how learning activities can affect the relationships between teachers, learners and other stakeholders, and of the way in which these relate to ‘good teaching’.

Theoretical work on relationships and on the ways in which communications can contribute to feelings of alienation or empowerment has a long history. R.D. Laing’s (1964) work on family therapy drew on the cybernetic anthropology of Gregory Bateson (2000). Paul Watzlawick also drew on Bateson’s distinction of ‘double-bind’ and ‘schizogenesis’ to create his ‘pragmatics of human communication’ (1967). Rom Harré has more recently synthesized Laing’s work with Searle’s Speech act theory into his ‘Positioning Theory’ (1999). This work has been applied to the treatment of Alzheimer’s patients (Sabat, 2001), and on change management (Boxer, 2001).

Positioning theory situates communicative action as part of a mechanism of ‘selfhood’ between communicating parties. This mechanism divides the ‘self’ into three layers which Harré calls ‘self 1’, ‘self 2’ and ‘self 3’. Self 1 designates the ‘intentional’ self - the ‘I’ within ones’ head (Sabat, 2003). Self 2 represents the ‘embodied’ self - the person who can do practical things in the physical world. Self 3 represents the self as it is realised through social interaction. Harré uses these distinctions to examine the effects that the circumstances and nature of communication can have on participants. In using this idea to research the treatment of Alzheimers patients, Sabat argues that much of the medical care that Alzheimers patients receive treats them as passive recipients, and doesn’t allow them to express themselves. Using Harré’s distinctions, Sabat argues that this amounts to a ‘suppressing’ of Self-3 and consequent feelings of alienation which can contribute to making the medical symptoms appear worse. Sabat shows that by communicating in a different way with sufferers (or ‘positioning’ them more effectively), and allowing them to take a more active role in conversations and in their treatment, patients can still feel their social actions to be meaningful.

This provision of opportunity for empowerment that positioning theory articulates is closely associated with creation of opportunities for individual social action. Seen in this way, the creation of learning activities also creates opportunities for meaningful social action by participants, where the positioning involved in the ‘sage on the stage’ model might otherwise not, particularly if understanding is ‘coerced’ or the medium of communication is inadequate. In Harré’s language, such a situation can lead to suppression of Self-3 - a similar mechanism to that identified by Sabat in healthcare.

8 Modelling the conditions for the adoption of Learning Design

Given these theoretical distinctions, we can begin to articulate a model of the conditions for the adoption of LD technology. The first element, as it is with all widespread adoption of new practice is a ‘common disruption’ - something which affects many communities of practice, and which demands that changes in practice are required. We have argued that the increasing globalisation of education could be

such a disruption, and the experiences at Bolton have demonstrated the extent to which the questions raised by globalisation highlight current problems and demand new answers.

We have argued that the challenges of globalisation are communicative, concerning the ways in which shared understanding might be established across different cultural contexts. Through using the distinctions about the different ways in which education seeks to disseminate understanding we argue that the designing of activities may provide opportunities for teachers to position themselves in a way which allows for understanding to be discovered by participants, avoiding the need for coercing or exhorting a particular view of the world. The staff development activity at the University of Bolton demonstrated how this might be achieved.

Given a shared understanding of the problems caused by the disruption and the nature of the solution to dealing with it, policy formation on the design of learning activities based on a renewed pedagogical foundation within Universities could follow, with the associated technological support of LD technology. We have argued that work on human communication could provide the foundation for this renewed thinking, and that the natural consequence of this view is the design of learning activities. In the challenge to provide flexible curricula, personalised learning and the employment of personal technologies, LD technology presents new ways to approach the organisation of education such that it increases the probability that meaningful relationships between teachers and learners might develop.

9 Conclusion

Bolton's international development has created a disruption within the institution which has affected many communities of practice, from teachers to administrators. This has forced the issue of teaching practice and globalisation into the spotlight. The challenges that this raises for the University relate to communication and the reproduction of learning experiences in different parts of the world. In the culturally diverse situation of the global university, we have argued that LD technology can provide an effective solution to these problems, by creating situations where understanding between stakeholders can emerge and be shared, rather than being coerced.

Communication, we have argued, is at the heart of some of the challenges of teaching and learning in a technological age. It demands richer theoretical understanding of the ways in which understanding is conveyed. We have presented Positioning Theory as a way of making distinctions about inter-personal communication. We have argued that this paradigm can not only provide explanatory frameworks for communicational problems, but point the way to solutions which address not only the immediate needs of teachers in overseas campuses, but also the needs of domestic teachers and learners struggling to cope with an increasingly instrumentalised, complex and fast-changing educational environment.

The contrast between the adoption of the VLE and the apparent lack of adoption of Learning Design technology tells us something about the ways in which practices change in the University. In modelling the possible conditions for the uptake of LD, we have made distinctions concerning the nature of the interventions that are made which can change practice (coercion, disruption and exhortation), and the motivation of stakeholders for sustaining new practices (structure and agency). Using these distinctions, we have argued that a priority for educational institutions is to create

contexts within which the formation of meaningful learning conversations between learners and teachers becomes more probable. Given this, in changing the positioning between individuals, the design and coordination of activities may be seen to be more than merely desirable.

10 References

- Archer, M. (1995), *Realist Social Theory: The Morphogenetic Approach*, Cambridge University Press: Cambridge.
- ASTRO (2010). Retrieved February 7, 2010 from <http://tencompetence-project.bolton.ac.uk/ldruntime/index.html>
- Boxer, L (2001) Using Positioning Theory to Make Change Happen. Retrieved November 20, 2009, from <http://jobfunctions.bnet.com/abstract.aspx?docid=59053>
- Harré, R (1984) *Personal Being: A Theory for Individual Psychology*. Harvard University Press.
- Bateson, G (2000) *Steps to an ecology of Mind*. University of Chicago Press.
- Bhaskar, R (1975) *A realist theory of science*. Sage.
- CopperCore (2008). Retrieved February 7, 2010, from <http://coppercore.sourceforge.net/>
- Johnson, M., & Liber, O. (2008) The Personal Learning Environment and the Human Condition *Interactive Learning Environments*, 16(1), pp. 3-15.
- Johnson, M., & Sherlock, D. (2009) Learner Reflexivity, Technology and Making our way through the world. *International Journal of Continuing Education and Lifelong Learning*, 19, pp. 352.
- Koper, R. (2001). *Modelling Units of Study from a Pedagogical Perspective: the Pedagogical Meta-model behind EML*, Educational Technology Expertise Centre Open University of the Netherlands. 2001. Retrieved from: <http://hdl.handle.net/1820/36>
- Rogers, G.A. (1964) *The Diffusion of Innovations*. Glencoe.
- Laing, R.D., & Esterson, A. (1964); *Sanity, Madness and the Family: Families of Schizophrenics*. Penguin.
- Osterhammel, J., & Petersson, N.P. (2003) *Globalization: A Short History* Princeton
- Pawson, R., & Tilley, N. (2002) *Realistic Evaluation*. Sage.
- Powell, S., Tindal, I., & Millwood, R. (2008) Personalized Learning and the Ultraversity Experience *Interactive Learning Environments*, 16(1) pp. 63-81.
- Sabat, S. (2001) *The Experience of Alzheimers Disease*. Blackwell.
- ReCourse (2010). Retrieved February 7, 2010, from <http://tencompetence-project.bolton.ac.uk/ldauthor/index.html>
- SLED (2010). Retrieved February 7, 2010, from <http://sled.open.ac.uk/>
- SPLICE (2009) The SPLICE Project. Retrieved November 20, 2009 from <http://www.jisc.ac.uk/whatwedo/programmes/elearningcapital/xinstit2/splice>
- Giddens, A (1986) *The constitution of society: Outline of the theory of structuration*.

University of California Press.

King, A. (1993) From Sage on the Stage to Guide on the Side. *College Teaching*, 41(1) pp. 30-35.

Watslawik, P., Bavelas, J., & Jackson, D. (1967) *The Pragmatics of Human Communication: Pragmatics of human communication; a study of interactional patterns, pathologies, and paradoxes*. Wiley.

Wilson, S., Liber, O., Griffiths, D., & Johnson, M (2007). Preparing for disruption: developing institutional capability for decentralized education technologies. *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007 (June 2007)*, pp. 1386-1395.

Facilitating Work-based Learning Projects: A Business Process-oriented Knowledge Management Approach

Yongwu Miao, Peter Sloep and Rob Koper

Centre for learning Sciences and Technologies, Open University of the Netherlands

E-mail: peter.sloep@ou.nl

Abstract: The knowledge generated and acquired in workplaces differs from that generated and sustained within formal academic and disciplinary structures. It is interdisciplinary and situated, and cannot be organized and structured as a traditional discipline-based course. This paper proposes to use the business process as a framework to structure and organize work-based knowledge for facilitating the creation, transfer, and use of knowledge across work-based learning (WBL) projects within the networked learning community. This approach supports representation and recording of externalized tacit and explicit knowledge and the finding of context-sensitive and task-relevant knowledge resources. We argue that IMS Learning Design (LD), with appropriate changes, can be used to represent WBL project plans and facilitate the creation and use of work-based knowledge through execution of the WBL project plan represented in LD.

Keywords: work-based learning, business process, knowledge management, learning design

1 Introduction

Work-based learning (WBL) is a class of university programmes that bring together the universities and work organizations to create special learning opportunities in workplaces (Boud and Solomon, 2003). In WBL, formal learning, informal learning and non-formal learning complement each other in progress toward formal recognition and accreditation of learning by universities (DEWBLAM, 2006). WBL has increasingly become an area of interest for the higher education sector (Brennan and Little, 2006).

The WBL programme is normally an individualized programme based on the learner's individual needs, interests and prior knowledge, and is also designed and planned to meet the needs of the organization (Boud and Solomon, 2003). The pedagogy is experiential in nature, centred on the application of learning in the workplace and evidence-based assessment of progress and achievement. This ensures that the workplace provides an opportunity for the practical application of knowledge and skills through action or problem-based projects (Thomas, 2008). A significant part of the WBL programme is one or more WBL projects. The majority of WBL projects can be conceptualized as research and involve learners in becoming practitioner-researchers (Costley and Armsby 2007). A WBL project may be defined and implemented in parallel to a real work project in the workplace and take the learner through a predefined learning process to reach some of the learning objectives (Fink et. al. 2007). A WBL project may be triggered by the need to solve a work-based problem or review an aspect of work practice, or introduction of a new procedure (Armsby & Costley 2000). A WBL project differs from a dissertation in that it demonstrates a range of practical capabilities in the workplace. It focuses on activities within the workplace that lead to

a product. WBL projects reflect a project cycle of activity: project planning, implementation and delivery, monitoring and evaluation (Middlesex, n. d.).

Designing and planning a WBL project is a complicated and time-consuming task because it should be unique to any individual. In the WBL community research on computer-mediated learning is limited (Bosley and Young, 2006). In the literature the research issue on technical support for planning and conducting WBL projects has not been addressed sufficiently. Especially, it is a challenge to support the gathering, storage, retrieval, and use of knowledge generated and needed in carrying out WBL projects. This paper proposes to adopt a business process oriented knowledge management approach to facilitate teachers, employees, supervisors, and representative of the organization who intend to create and share work-based knowledge. Facilitation is done through collaboratively designing and executing WBL project plans. We claim that IMS Learning Design (IMS LD, 2003), with appropriate changes, can be used to represent, communicate, negotiate, customize, and execute WBL project plans and facilitate the creation and sharing of work-based knowledge within and across WBL projects.

2 Knowledge Management for Supporting WBL Projects

The knowledge generated and acquired in WBL projects is either tacit or explicit. Tacit knowledge (Polyani, 1967) is personal knowledge embedded in individual experience (e.g., personal beliefs, perspective, and the value system). Tacit knowledge is hard to articulate in language (hard, but not impossible). Before tacit knowledge can be communicated, it must be converted into words, models, or numbers that can be understood. Explicit knowledge, however, is expressed or codified in symbols and can be communicated to other individuals by using these symbols (e.g., business process models and structured data objects in databases). Nonaka & Takeuchi (1995) discuss the modes of knowledge creation and conversion that are derived from explicit knowledge and tacit knowledge: socialization, externalization, combination and internalization (SECI). Their SECI model postulates a four-stage process through which tacit knowledge of individuals is shared with others through socialization, and then converted into explicit knowledge through externalization; new explicit knowledge is generated through combination with existing sources of explicit knowledge, and then reconverted into tacit knowledge through a process of internalization. While explicit knowledge can always be externalized, tacit knowledge can sometimes be externalized by indirect externalization through apprenticeships, conversation, mentoring, and storytelling, as recommended by Johannessen et al. (2001) and Lubit (2001). The recorded, externalized knowledge is called a knowledge artefact. The knowledge that is internalized in a person's head is called participant knowledge. Both knowledge artefacts and participant knowledge are knowledge resources of the organization (Holsapple and Joshi, 2002). Participant knowledge is affected by the arrival and departure of the knowledgeable participant and by participant learning. As opposed to this, a knowledge artefact does not depend on a participant for its existence. Representing knowledge as a knowledge artefact involves encoding that knowledge in an object, thus positively affecting its ability to be transferred, shared, and preserved (Kalpič and Bernus, 2006).

Since knowledge resources are valuable for the organizations and WBL projects, it has been recognized that teachers, learners, and relevant stakeholders need help with information and communication technologies (ICTs) to represent, gather, archive, and share the knowledge generated and required in carrying out WBL projects.

Technologies produce value when they increase the accessibility of knowledge, reduce the time and effort to record and keep it, and further facilitate knowledge conversion process between the individual and the organization, and between the tacit and explicit knowledge. Many WBL practitioners use online communication tools like discussion boards, chat, messaging, emails, forums, and weblogs to share knowledge. For example, Costa (2007) reported that weblogs can assist in creating a WBL community in which ideas and tacit knowledge can be expressed, commented, and shared swiftly, thus facilitating a flow of knowledge that can then be applied into the workplace in a timely manner and stored for later use.

In the same vein, we propose to adopt a business process oriented knowledge management approach to help networked learning communities create and share tacit and explicit knowledge within and across WBL projects.

3 A Brief Introduction to Business Process-oriented Knowledge Management

A business process is a set of coordinated activities performed by people using resources under certain conditions in order to achieve a specific organizational goal. A business process model (BPM) is an abstract description of a particular business process or a set of business processes with common characteristics. In the context of business process re-engineering, a BPM is typically a representation of explicit knowledge about well-structured work process and the certain valuable knowledge produced and needed in performing activities is not explicitly contained.

In knowledge-intensive organizations, business processes typically become more and more knowledge intensive (Eppler, et. al. 1999). The emergence of knowledge-intensive business processes prompted the research on Business Process-oriented Knowledge Management (BPoKM) (Jablonski, et. al. 2001; Abecker, et. al. 2002; Papargyris, et. al. 2002; Abecker, 2004). The BPoKM approaches focus on aiding knowledge workers to effectively build up the knowledge and abilities that they need to fulfil tasks in their business processes (Strohmaier, 2005). The BPoKM is based on the assumption that the employees of a company normally perform their activities within defined business processes. Then, a BPM is used as a framework to organize knowledge archives as an organizational memory. Thus, a BPoKM system enables an automatic, context-sensitive storage and access of task-relevant knowledge in the operational processes of the organization (Abecker, 2004). This means that an employee can receive precisely the knowledge resources needed to perform the current activity in carrying out the business process with an extended workflow management system. Additionally, the new knowledge artefact that the employee creates while performing an activity can be gathered and stored in association with the activity. The BPoKM systems are helpful to avoid the problems of traditional knowledge management systems, such as the need of additional work (e.g., handling keywords or tags), lack of time to look for information, and unawareness of the existence of pertinent information. They minimize the risk of losing vital knowledge when key individuals become unavailable or leave the organization.

4 A BPoKM Approach to Support WBL Projects

We propose to adopt a BPoKM approach to support WBL projects. Our approach can be characterized by: 1) building a business process model and knowledge repository, 2) making a WBL project plan by reusing, customizing, or creating a business process

model, and 3) supporting contextualized learning through working with the project plan.

4.1 Building a Business Process Model and Knowledge Repository

Business processes relevant to WBL programmes can be identified, codified, and stored in the repository as reference BPMs. The BPM could be a descriptive model that abstractly describes how a business process has been performed (e.g., a best practice). It could also be a prescriptive model which intuitively articulates the way in which a desired business process should/could/might be performed (e.g., a pilot project).

A BPM may have alternative and similar BPMs in the repository. For example, in the business of real estate development different business processes can be performed to achieve the same or a similar goal. They can be modelled and stored as alternative or similar models. In addition, A BPM may have sub-BPMs. For example, a real estate development process typically consists of series of sub-processes such as forming the development concept, carrying out a feasibility study, planning & financing, construction, and operation/sale.

Like a conventional BPM, our BPM specifies how people with different roles collaboratively perform activities in sequence and/or in parallel to create products/services by using resources and tools. For example, the real estate development process requires the skills of many professionals such as market consultants, architects, and finance consultants. Examples of key activities which need to be carried out in the first step “forming the development concept” are evaluating lands/sites, investigating market for alternative uses, developing basic architectural design ideas and program, estimating cost, identifying sources of finance, identifying roles and project team, estimating project development cost, designing general project management system, and documenting a development concept. The development concept is the expected output of the first process.

Unlike a conventional BPM, our BPM is additionally used as a framework to organize knowledge. Proficiency competences needed at certain levels for each role to perform a knowledge-intensive activity in the business process would be specified. The relations between competences and the prepared learning materials useful for developing the competences will be defined in the system. Note that the knowledge generated and acquired in workplaces differs greatly from that generated and sustained by academic institutions. As Gibbons et al., (1994) and Scott (1997) distinguished, while ‘Mode 1’ knowledge (e.g., architectural design) is developed within formal academic and disciplinary structures in the context of discovery, ‘Mode 2’ knowledge (e.g., knowledge about a particular market) is developed through problem solving in the context of application. ‘Mode 2’ knowledge production normally takes place in cross-disciplinary project-based teams. These teams bring together a variety of disciplines and experience to solve or pose specific problems or undertake a task. Thus, ‘Mode 2’ knowledge cannot be authoritatively encoded in traditional forms of scholarly publication and structured as a discipline-based curriculum. The context of application, in contrast, describes the total environment in which scientific problems arise, methodologies are developed, outcomes are disseminated, and uses are defined (Nowotny et al. 2003). The use of BPM provides an opportunity to associate ‘Mode 2’ knowledge with the concrete situation in which the knowledge is developed and needed to perform a specific activity.

4.2 Making a WBL Project Plan

When making a WBL project plan, teachers, employees, workplace supervisors, and representatives of the organization can collaboratively identify the focus and knowledge requirements of the WBL project according to the prior knowledge and the needs of the employees, the past/ongoing/future workplace projects, the competence development plan of the organization, and the available WBL programmes and award requirements of the university. Then they can try to find appropriate BPMs in the repository. The factors to take into account are organizational aspects (e.g., work units, roles, required and objective competences for each role), task aspects (e.g., developing concept and making an architectural plan), product/service aspects (e.g., a building and a developing area), and others (e.g., estimated duration and cost, specific methods and techniques, the degree of detail, the degree of mature, the region and language). They can customize, refine, and/or combine the selected BPMs and even develop a new BPM. It should be clear that some knowledge-intensive activities could hardly be explicitly structured in advance. Hence, it should be allowed to specify certain sub-processes informally or as a set of unstructured activities. After the BPM has been designed, on the one hand, they assign the metadata (e.g., involved roles, task type, product type, and duration) of the BPM and indicate the relations with other BPMs and activities (e.g., alternative, similar, is_a_part_of, precede and succeed); on the other hand, they instantiate the BPM as a WBL project plan and assign roles to co-learners/workers, workplace supervisors and tutors.

4.3 Executing a WBL Project Plan

After planning, the participants can start to perform activities following the WBL project plan. To perform an activity, the learners can get basic guidance from reading the activity description. In addition, the knowledge needed to perform the activity can be acquired through reading relevant learning materials (about mode 1 and mode 2 knowledge) available and accessible in the activity workspace while working on the expected output. The facilities to search personalized learning materials are based on user models and the mappings between the competences and learning materials. The issue of how to organize this is beyond the scope of this paper and will not be discussed in detail. If the learner has problems or questions, s/he can use communication tools (e.g., a chat and a forum) to discuss the problem and seek for solutions with co-learners/co-workers, workplace supervisors, and teachers. The discussion (e.g., chat protocol) can be recorded and stored in the activity workspace. Learners are also encouraged to write and comment on their ideas, work experiences, and reflective reports during and after the completion of the task. Such externalized tacit knowledge will be helpful for getting assistance, being assessed, and sharing and converting knowledge. While carrying out a WBL project, the learner is not only learning how to do his/her existing job, but also extending his/her present work (Boud and Solomon, 2000). Unlike in a real work project, learners can try to use alternative strategies and explore new strategies to get the work done in a WBL project. If the learner develops a new work strategy to fulfil the task successfully, s/he is encouraged to describe the strategy informally (externalized tacit knowledge). The learners and teachers can discuss and improve the new strategy. If the process becomes mature and can be formally modelled, they can articulate the work process and put it into the repository as a new BPM (converting tacit knowledge into explicit knowledge).

It is important to note that the externalized tacit and explicit knowledge (knowledge artefact) created in an activity can be stored automatically or manually (depending on

the policy selected) with the activity. Since the context is known from its being embedded in the business process, the knowledge creators do not need to assign keywords or categories to the knowledge artefact (which is not easy to do, especially for describing tacit knowledge). Later on, when other learners need to do the same or a similar task, the knowledge artefact can be found easily without the need to describe knowledge using keywords. In addition, it is technically possible to build the connection between the knowledge artefact and the knowledge creators/holders within the networked learning community. Thus, the BPoKM approach is helpful for avoiding the problem to get a large number of inappropriate knowledge resources just because the content of the knowledge artefact and context of its development and application are not (and even cannot be) precisely or appropriately described and matched.

5 Using IMS Learning Design to Facilitate WBL Projects

Implementing such a business process oriented knowledge management system for supporting WBL projects will meet with many obstacles. Apart from, for instance sociability, privacy, and security problems, there are many technical challenges such as competence model, user model, task ontology, dynamic change of the BPM, and maintenance and update of the knowledge base. In this paper we focus on discussing the issues about process modelling languages for representing WBL project plan.

Currently many process/enterprise modelling languages have been released and used to represent BPMs such as OMG's UML Activity Diagram (version 2.2) (UML, 2009.), Business Process Modeling Notation (BPMN, 2004), XML Process Definition Language (XPDL, 2008), The Process Specification Language (PSL) (ISO 2003), Architecture of Integrated Information Systems (ARIS) (Scheer 2000), and ArchiMate (ArchiMate, n. d.). Existing modeling languages have different foci (e.g., organizational aspect, process aspect, technical aspect, or visualization aspect). For different purposes, different modeling languages have been used to implement BPoKM systems. For example, the PROLIX project (PROLIX, 2006) uses the ARIS framework to integrate training courses into business processes (Leyking, et. al. 2007). Yet Another Workflow Language (YAWL, 2007; van der Aalst and ter Hofstede, 2005) is used in the APOSDLE project (APOSDLE, 2006) for the workflow based process representation of the task model. However, the target users of these languages are IT specialists, business designer and business analysts. In addition, existing BPoKM approaches mainly support workplace learning (in-house training) with a real workflow (including technical infrastructure, documents, and products) in an organization for improving effectiveness and efficiency of the real work. They do not intend and are not suited to support research-oriented WBL projects that involve teachers, learners, and supervisors from different organizations within a networked learning community.

It seems that, for our purposes, there are two conflicting requirements for choosing a process modeling language. On the one hand, it should have sufficient expressiveness to model business processes. On the other hand, it should be as accessible as possible for ordinary teachers, employers, employees, supervisors, and other stakeholders to understand and use. Thus, it is required to explore the trade-off between expressivities and usability. In addition, the process modeling language should be formal so that the computer can understand and enact the BPMs represented in the language. Moreover, it would be desirable that the language could be used to represent both discipline-based courses and WBL project plans in a homogeneous manner, and that the same learning environment can support both explicitly

formalized learning and the non-formal/informal learning in workplaces. Considering all these requirements, we propose to use IMS LD as a framework to represent WBL project plans and organize work-based knowledge.

IMS LD was developed to allow lesson plans and best practices to be structured using a common language based on a formal representation and archived in a machine readable and searchable repository. It is a pedagogy-neutral modeling language and can be used to model a wide range of pedagogical strategies such as rationalist and cultural-historic strategies (Koper 2001; Sloep et al. 2005). It has many features (e.g., activity-centric models, embedded sub-processes, and explicit role models) that are exactly required to represent a WBL project plan as discussed in the last section. Recent studies also reported that, although ordinary practitioners still had some problems, they could successfully build learning designs at level A and partially at level B if they were given access to user-friendly authoring tools (Neumann and Oberhuemer, 2009; Griffiths, et. al. 2009). Therefore, IMS LD is a good candidate provided we can decrease the technical complexity of the modeling language and increase the expressiveness to sufficiently represent a WBL project plan. In this section, we discuss some initial ideas to modify IMS LD for facilitating a WBL project.

Introduce “artifact”: The concept of an *artifact* needs to be introduced in order to represent the knowledge artifacts that are created/used in the WBL project. A knowledge artifact may be an expected output of an activity such as an architectural plan or an unpredictable, externalized tacit knowledge such as a recorded reflection. Although sometimes it is technically possible to represent a predictable output using the concept (or construct) of the *property* in IMS LD, such a simple model with a primitive data-type (e.g., a string, an integer, a file, and a URL) is not sufficient to implement the system functions needed. For example, to model an architectural plan or a recorded reflection it is possible to model it using a *property* with a data-type “file” or “text”. However, more information has to be modeled with the artifact content such as *artifact_type*, *description*, *state*, *owner*, *contributors*, *creation_time*, and *access_rights*. These artifact attributes are needed by the system to manage and retrieve the knowledge artifact. If these attributes are defined as separate *properties* (note: *property group* is not suited here because all members of the *property group* must have the same data-type), it is impossible for the system to manage the relations between these user-defined *properties*. In addition, the *property* cannot be used to represent an unpredictable knowledge artifact such as a reflection recorded, because a *property* has to be declared explicitly at design-time. The introduction of the concept of *artifact*, if done properly, will provide a way to model and support processes of knowledge creation and sharing in WBL projects.

Use a generic term “activity”: Not only learning activities but also working activities are performed in WBL projects. Although taking place at the same location, they are not the same. Work is directed towards producing some output. Learning is directed towards the acquisition of knowledge or the capacity to gain further knowledge. Many work assignments require employees to engage in learning before the work can be effectively completed. In fact, WBL typically emphasizes learning beyond the immediate and necessary requirements of work completion. The knowledge that is the object of learning may or may not be closely related to whatever the organization produces now or in the future (Boud and Solomon, 2000). However, to the external observer the activities associated with each may not be easily separated. Moreover, with respect to the LD specification it would not be necessary to distinguish between learning activity and working activity, because their differences in internal structures

and relationships with other elements are not significant from the perspective of modeling. Analogously, the boundary between a *learning activity* and a *support activity* becomes blurred sometimes in a WBL project. For example, if a market consultant helps a finance consultant to estimate cost, it is difficult to declare it as a support activity or a learning activity from the perspective of modeling, because both consultants learn from and support each other. Thus, it is suggested to abandon the distinction between learning and support activities and use a generic term “activity” to represent all kinds of activities. Furthermore, users should be allowed to define attributes as activity-properties for describing context in order to make it easy to manage and find activities.

Introduce new activity structures: The current version of LD enables to specify the control-flow at two levels using pre-defined structures. A *play* consists of a set of *acts* structured as a recommended sequence (note: it is not a strictly controlled sequence except to explicitly specify the completion of the acts). An *act* consists of a set of unstructured *role-parts* that can be performed in arbitrary sequence or in parallel except if they are used to explicitly specify temporal relations between these activities using *conditions*. In addition, two *activity structures* (*selection structure* and *sequence structure*) make it easy to specify lower-level control-flows in a hierarchical structure. However, in order to specify various process structures in WBL projects, more activity structures (e.g., alternative structure and concurrent structure) at any level may be required. Although *conditions* can be used to model some types of control-flows, it is very difficult to model complex, hierarchically structured work processes. Sometimes it is even impossible to exactly model some situations because the semantic of “*show/hide activity*” is different from that of “*start/complete activity*”. It is not only an issue for the design of the user interface of the modeling tool, but also an issue for the design of the modeling language itself. Because of the technical complexity of this issue, we do not discuss it in greater detail.

Replace the personal-property with the role-member-property: When defining a *personal property* (e.g., the user name) with LD, every participant will individually have this property. However, if a property is relevant to a particular *role*, use of *personal property* will be not appropriate. For example, if the proficiency level of the competence “architectural design” of an architect is calculated as a mean of assessment results (represented as competence levels) of all supervisors, the *personal property* is not suitable for modeling the assessment result of the supervisor, because only the supervisor is arranged to assess the competence of the architect and other roles do not need this property. Note that use of the *local/global property* is not suited to model this situation either, because the exact number of supervisors in each run is unpredictable. It is proposed to replace the *personal property* with a concept of “*role-member-property*”. A *role-member-property* can be regarded and defined as an attribute of a person with a particular role. Like a *role-property*, a *role-member-property* is associated with a *role*. Unlike a *role-property* that represents a common feature of all members of the *role*, a *role-member-property* is used to model the same feature of each role member individually. According to this concept, a *personal property* of IMS LD (like the user name) can be defined as a *role-member-property* of the root-role. It is also needed to enable accessing *role-member-property*, for example, to calculate the mean of assessment results assigned by all supervisors. Then, introduction of the *role-member-property* will make it easy for WBL practitioners to build and share role models and for the system to manage and find participant knowledge.

6 Conclusions and Future Work

Work-based knowledge exists inside and outside an organization in explicit and tacit forms. In order to support effective and efficient learning in WBL projects it would be nice if the knowledge developed in past WBL projects can be archived and reused. The challenge is how to facilitate people to find and acquire knowledge, and to convert and represent tacit and explicit knowledge. In this paper, we propose to adopt a business process-oriented knowledge management approach to facilitate WBL projects. This approach can be characterized by: 1) providing a collection of BPMs and use a BPM as a framework to anchor knowledge in the work activities where the knowledge is developed and required; 2) enabling teachers, learners, and other stakeholders to develop a WBL project plan through reuse, customization, combination of BPMs; and 3) scaffolding learning by executing the WBL project plan, delivering context-sensitive and problem-oriented knowledge artifacts, and supporting the production, conversion, and representation of tacit and explicit knowledge in the context of application. Through analyzing the requirements for the process modeling languages, we propose to use IMS LD, with necessary changes, to represent WBL project plans. We suggest introducing the concept of an “artifact”, using a general term “activity”, enriching control-flows to some extent, and replacing the “personal property” with the “role-member-property”.

The TENCompetence project (TENCompetence n. d.) has developed an infrastructure that can support the creation and management of networks of individuals, teams and organizations. Within these 'learning networks', participants can create, store, use and exchange knowledge resources, learning activities, units of learning, competence development programmes and networks for lifelong competence development. The tools provided by the infrastructure can be used to create WBL programmes, manage e-portfolio, conduct assessments, and deliver learning modules. However, the tools provide insufficient support for creating WBL project plans and gathering/delivering context-sensitive and task-relevant knowledge resources. An interesting research work direction will be to extend/modify LD authoring tool according to the suggestions made and develop/integrate knowledge management functions with the LD player. After this, the application of the TENCompetence infrastructure in WBL can be tested and evaluated.

Acknowledgement

The work on this paper has been sponsored by the TENCompetence Integrated Project that is funded by the European Commission's 6th Framework Programme, priority IST/Technology Enhanced Learning. Contract 027087

References

- Abecker, A., Hinkelmann, K., Maus, H. and Müller, H.J. (2002). *Geschäftsprozess-orientiertes Wissensmanagement*. Springer, Berlin.
- APOSDLE (2006). Retrieved from: www.aposdle.tugraz.at/
- ArchiMate (n. d.). Retrieved from: <http://www.archimate.org/eg/home/>
- Armsby, P., & Costley, C. (2000). Research driven projects. In Portwood, D. & Costley, C. (Eds), *Work-based learning and the university: new perspectives and practices*. Birmingham: Staff & Educational Development Association.

- Bosley, S., & Young, D. (2006.) Online learning dialogues in learning through work, *Journal of Workplace Learning*, 8(6): 355-366.
- Boud, D., & Solomon, N. (2000) Work as the curriculum: Pedagogical and identity implications. *Paper presented in Conference Working Knowledge: Productive learning at work*, December 10-13, 2000, Sydney, Australia.
- Boud, D., & Solomon, N. (Eds.) (2nd Edn. 2003) *Work-Based Learning: A New Higher Education?* Buckingham, SRHE & Open University Press.
- BPMN (2004), Business Process Modeling Notation (BPMN), Retrieved from: <http://www.bpmn.org/>
- Brennan, J., & Little, B. (2006). *A Review of Work-based Learning in Higher Education*. Department for Education & Skills.
- Costa, C. (2007). A professional development weblog: supporting work-based learning in a TAFE library, *Australian Library Journal*, 56(1), pp. 36-55.
- Costley, C., & Armsby, P. (2007). Methodologies for undergraduates doing practitioner investigations at work. *Journal of Workplace Learning*, 19(3): 131-145.
- DEWBLAM: Development of European Work Based Learning Approaches and Methods, DG EAC funded project (2006), *Work-based Learning Guidelines*, p.3, Florence.
- Eppler, M. J., Seifried, P. M., & Öpnack, A. R. (1999). Improving Knowledge Intensive Processes through an Enterprise Knowledge Medium. *In Proceedings of the 1999 ACM SIGCPR conference on Computer personnel research*, 222 - 230, New Orleans, Louisiana, USA.
- Fink, F., Rokkjær, O., & Schrey, K. (2007) *Work-based Learning and Facilitated Work-based Learning*, Retrieved from: <http://www1.unifi.it/tree/dl/oc/d8.pdf>
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The dynamics of science and research in contemporary societies*. London: Sage.
- Griffiths, D., Beauvoir, P., Liber, O., & Barrett-Baxendale, M. (2009). From Reload to ReCorse: Learning from IMS Learning Design Implementations, *Distance Education*, 20(2), pp. 201-222.
- Holsapple, C. & K. (2002), A knowledge management ontology, in Holsapple, C.W. (Eds), *Handbook on Knowledge Management*, Springer, Berlin, Vol. 1, pp.89-128.
- IMS LD (2003). IMS Learning Design Specification. Retrieved from: <http://www.imsglobal.org/learningdesign/index.cfm>.
- ISO (2003). Industrial Automation System and Integration -- Process Specification Language. No. 18629-11, International Organization for Standardization.
- Jablonski, S., Horn, S., & Schlundt, M. (2001). Process Oriented Knowledge Management. *In Eleventh International Workshop on Research Issues in Data Engineering: Document Management for Data Intensive Business and Scientific Applications*, pp.77-84, Heidelberg, Germany, IEEE Computer Society.
- Johannessen, J.A., Olaisen, J., & Olsen, B. (2001) Mismanagement of tacit knowledge: The importance of tacit knowledge, the danger of information technology, and what to do about it, *International Journal of Information Management*, 21(1), pp. 3-20.

Facilitating Work-based Learning Projects: A Business Process-oriented Knowledge Management Approach

- Kalpič, B and Bernus, P. (2006) Business process modeling through the knowledge management perspective, *Journal of Knowledge Management*, 10(3), pp. 40-56.
- Koper, R. (2001). *Modelling Units of Study from a Pedagogical Perspective: the Pedagogical Meta-model behind EML*, Educational Technology Expertise Centre Open University of the Netherlands. 2001. Retrieved from: <http://hdl.handle.net/1820/36>
- Leyking, K., Chikova, P., Martin, G., & Loos, P. (2007). Integrating Learning and Business Process Management, in *Proceedings of the 18th Australasian Conference on Information Systems*, 981-990, Dec. 5-7, 2007, Toowoomba.
- Lubit, R. (2001). The keys to sustainable competitive advantage: Tacit knowledge and knowledge management, *Organisational Dynamics*, 29(3), pp. 164-78.
- Middlesex University (n. d.) Projects in Work Based Learning, retrieved from <http://mdx.ac.uk/wbl/cfe/projects.asp>
- Neumann, S., & Oberhuemer, P. (2009). User Evaluation of a Graphical Modeling Tool for IMS Learning Design. In *proceedings of the 8th International Conference on Web-based Learning (ICWL)*, pp. 287-296. August, 19-21, 2009, Aachen, Germany: LNCS 5686, Springer.
- Nonaka, I., & Takeuchi, H. (1995) *The Knowledge Creating Company*, Oxford University Press, Oxford.
- Nowotny, H., Scott, P., & Gibbons, M. (2003). Introduction: `Mode 2' Revisited: The New Production of Knowledge, *Minerva*, 41(3), pp.179-194, Springer Netherlands.
- Papargyris, A., Poulymenakou, A., & Samiotis, K. (2002). Knowledge Processes Embedded in Task Structures: Implications for the Design of a Technical and Organisational Solution, in *Proceedings of the 4th International Conference, Practical Aspects of Knowledge Management*, Lecture Notes in Computer Science, Volume 2569/2002, pp. 425-436. Springer Verlag.
- Polanyi, M. (1967) *The Tacit Dimension*, New York. Anchor Books.
- PROLIX project home page, (n. d.) retrieved from: <http://www.prolixproject.org/index.php>
- Scheer, A.W. (2000). *ARIS - Business Process Modeling*. Springer Verlag.
- Scott, P. (1997). The changing role of the university in the production of new knowledge. *Tertiary Education and Management* 3(1), 5-14.
- Sloep, P. B., Hummel, H. & Manderveld, J. (2005). Basic design procedures for e-learning courses. In R. Koper & C. Tattersall (Eds.), *Learning design: A handbook on modelling and delivering networked education and training* (pp. 139-160, 367-385). Heidelberg: Springer Verlag.
- Strohmaier, M. B. (2005). *B-KIDE: A Framework and a Tool for Business Process Oriented Knowledge Infrastructure Development*, PhD Thesis, Publisher: Shaker Verlag.
- TENCompetence (n.d.). TENCompetence project website. Retrieved from <http://www.tencompetence.org/>
- Thomas, T. (2008) Bringing Learning to the Workplace, *Paper presented in a synopsis of the inaugural lecture*. Retrieved from http://www.lsbu.ac.uk/esbe/engineering/pdf/Bringing_Learning_to_the_Workpla

ce.pdf

UML (2009). *UML 2.2 superstructure Specification*. Retrieved from:
<http://www.omg.org/spec/UML/2.2/Superstructure/PDF>

van der Aalst, W., & ter Hofstede, A. (2005) YAWL: Yet Another Workflow Language.
Information Systems, 30(4), pp. 245-275.

XPDL (2008) *XML Process Definition Language website*. Retrieved from
<http://www.wfmc.org/xpdl.html>

YAWL (2007). YAWL workflow language website and tool. Retrieved from:
<http://www.yawl-system.com/newyawlwebsite>

A tool for the auto-management of Units of Learning: the Link Tool

Mar Pérez-Sanagustín¹, Roy Cherian², Davinia Hernández-Leo¹, David Griffiths² and Josep Blat¹

1. Department of ICT at Universitat Pompeu Fabra, Roc Boronat 138, 08018 Barcelona, Spain and Barcelona Media Research Center, Av. Diagonal 177, planta 9, 08018 Barcelona, Spain
2. The Institute for Educational Cybernetics at the University of Bolton, Bolton, UK

E-mail: davinia.hernandez@upf.edu

Abstract— Prior to learning with an IMS LD Unit of Learning a run must be created, learners added, and a link to the run provided. In the context of Lifelong Learning or Open Learning Resources there may be no designated administrator available to manage access for the users who will participate in a UOL at any given time, or to provide links to the appropriate active run. In this case the user has to take responsibility for this process before they can start on the learning activities. There is therefore a need for new tools supporting the auto-management of UOLs conforming to the IMS LD specification. This paper presents a list of requirements arising from using Units of Learning in a pilot performed in the context of La Verneda School for adults in the Àgora association. We also present the first version of the tool developed according to the requirements and a summary of the results of using it in a second pilot in the same school.

Keywords— IMS learning design, provisioning lifelong learning, unit of learning, run

1 Introduction

A 'unit of learning' is an abstract term used to refer to any delimited piece of education or training, such as a course, a module, a lesson, etc (IMS Global Learning, 2003). When these units of learning are computationally represented following the IMS LD specification they are called a full ready-to-run Unit of Learning (UOL) that can be authored, interpreted and run in different tools. IMS LD is an educational modelling language used to develop applications in educational contexts (Koper & Tattersall, 2005). In the TENCompetence project, this specification was adopted as the facto standard.

One of the commitments of the project is to promote the adoption of the IMS LD specification in diverse educational contexts. A number of IMS LD compliant tools have been developed for authoring (TENCompetence, 2009b; Hernández-Leo et al., 2006), instantiation (Hernández-Gonzalo et al. 2008) and runtime (TENCompetence, 2009a). Some of these have been successfully tested in various learning contexts (Hernández-Leo et al., 2007). However, in a lifelong learning context these tools show some limitations. A pilot study carried out in the Association of Participants Àgora (Louys et al., 2009) identified a set of problems regarding the management of UOLs. To execute

and perform a UOL it is necessary to define the list of students, the roles that each student will take, and the course activities that they will participate in. This requires the creation of a *run*, which is an instance of a UOL that enables learners to participate in the activities which it defines (Tattersall, Vogten, Brouns, Koper, Van Rosmalen, Sloep and Van Bruggen, 2005). Only those students registered in a run are allowed to execute (or run) the UOL. Normally, the creation of a run, and the assignation of the students to it is the task of an administrator or a teacher who decides who is to participate in which UOL. But in a lifelong learning context each learner organizes their own training and decides in which course they want to participate. The role of the teacher may disappear, and the learners should be able to create their own runs and manage their courses. The experience of the pilot showed that current tooling was not satisfactory to support the self-management of UOLs in lifelong learning contexts and new solutions were needed.

Various solutions addressing similar problems have been developed in other areas, e.g. in identity roll-on and roll-off processes in a company or automatic subscriptions to online courses provided on the Moodle platform (Moodle, 2009). Although these solutions resolve the needs in their particular areas, they are not sufficient to meet the requirements in a scenario involving auto-management of UOLs a Lifelong Learning context. Moreover, tooling compliant with IMS LD is not available to support the user in the management of their courses. The aim of this study is to understand the needs generated by UOL management in lifelong learning contexts. More specifically, we analyse the use of an LD Runtime System in the context of Àgora and offer a tool called *Link Tool*⁶ as a solution to support the management of UOLs in such as contexts.

This paper is structured as follows. Section 2 describes and analyses the solutions adopted in the first Àgora pilot to resolve problems in managing UOLs. From the results of the analysis, we present the main requirements regarding the management of UOLs in this context and the proposed solutions. Section 3 presents the details of the Link Tool as the first approach to meeting these requirements and presents the results of its use in a second pilot in the Àgora Association. Finally, section 4 sets out the main outcomes and indicates future work.

2 Requirements for supporting the self-management of UOLs in Lifelong learning contexts

To understand the requirements arising from the management of UOLs in a lifelong learning context, we analyse a pilot carried out in the authentic context of the Association of Participants Àgora. The main aim of the pilot was to implement, test and investigate the benefits of the TENCompetence infrastructure and its support for the participants' competence development (Louys et al, 2009). The participants in the pilot used the Personal Development Plan (PDP), the PDP tool developed in the TENCompetence project, as the central tool for the creation of their own personal development plans and the performance of the activities. Some of the activities were UOLs codified in IMS LD that run in the TENCompetence LD Runtime System (TENCompetence, 2009a). The LD runtime system is compliant with the IMS Learning Design specification (Koper and Oliver, 2004) and facilitates the provision of structured activities (similar to courses) that learners can follow as part of their competence development. It provides an administrator view for uploading UOLs, registering users and creating runs and a player view that allows the learner to perform the activity. In

⁶ At some stages of work this was referred to as the LD Admin tool

this section we describe the use of LD Runtime functionalities for managing UOLs in this context and report and analyse the solutions adopted to deal with its limitations. The results from the analysis lead to a set of requirements needed for the development of a new tool able to support the whole process in such contexts.

2.1 *Administrating UOLs in the first Àgora Pilot*

All the UOLs in the pilot were created by two expert authors using the Recourse LD Editor (TENCompetence, 2009b). All were designed to include collaborative widgets (chats in most of the cases) and with a single learner role (UOLs can be designed including different roles with different privileges when performing the course). The administrator of the system (an IMS LD expert) used the LD Runtime administration tools to upload the UOLs to a server and register the users participating in the experience. The administrator generated one instance for each course by creating a *run* for each of the UOLs uploaded and enrolled all the participants to these *runs* in order to associate the registered participants with the courses available. All these steps were carried out before starting the course.

When the pilot started, the learners accessed the UOLs from an activity in the PDP tool in which there was a link to the LD Runtime and the title of the Unit of Learning. When they clicked on the link, they were redirected to the LD Runtime (via an Internet browser), logged in to the system with the credentials facilitated by the administrator and accessed the list of runs associated with the UOLs for which they were registered. By clicking on the *run*, they could access to the LD Runtime players and run the UOL to perform the activity.

During the pilot some problems and limitations of the LD Runtime system were identified, not only regarding the administration processes before the course but also in supporting unexpected situations once it had started. In the following lines, we describe the main problems and the solutions adopted. Figure 1 depicts the full workflow of the whole process.

- *Registering the users.* The LD Runtime system available did not include a registration module enabling users to self-register. For the pilot the registration process was carried out by the administrator. Before commencing all the users enrolled in the course were registered on the system and given their credentials by email. However, during the pilot some new students who had not been registered in advance. As a solution, the administrator needed to maintain a list of users with their respective users and passwords that was updated when a new user join the course.
- *Repeating a course.* One of the main problems to appear during the pilot was that some students wanted to repeat one of the courses that they had already followed. Since the instance of a course is related to a unique run, a user can perform the UOL only once. If the learner accesses the same run again they find it marked as finished. For the pilot, this was resolved via email. When the users wanted to repeat a UOL they sent a message to the administrator and he/she created a new run of the same UOL only for that user. The administrator maintained a list with the runs created for each of the users and informed them when the run was ready.
- *Identifying the correct UOL.* The user linked to the LD Runtime player from a particular activity in the PDP. Once in the player, they were offered a list of runs, and the learner was intended to choose the run indicated in the PDP activity. The users had some difficulties in identifying the run they had to

select. To facilitate this process, all the runs were named with the title of the UOL and the links in the PDP activities were edited with exactly the same name. In this way, the users could better identify the correct run. To avoid conflicts with the name of the runs associated to the same UOL (see the case of repeating a course in the bullet above) all the runs were described with the number of the run that the user was going to play (e. g. “Practice Vocabulary-1” for the first run and “Practice Vocabulary-2” for the second run of the same UOL titled “Practice Vocabulary”).

2.2 Analysis of the requirements

If we examine the whole process followed in the Àgora Pilot, we observe that all the solutions adopted for managing the UOLs depended on the administrator. However, in a lifelong learning context the learners should be able to register on the system and create their own runs of the UOLs they are interested in. To achieve this the learner must be provided with some sort of administration tools, which ideally will be very easy to use or hidden behind the scenes. From a detailed analysis of the problems detected in the Àgora pilot, we set out in Table I the limitations of the LD Runtime tool used in the pilot and propose a set of requirements as a basis for developing a tool for the management of UOLs in a lifelong learning context.

The problems in Table 1 arise directly from the contingencies of the Àgora Pilot and are highly context-related. But, the requirements extracted are sufficiently generic to be relevant to other lifelong learning scenarios. In section IV we consider other requirements that could be also considered.

Table 1 - List of requirements detected from the Àgora pilot

Limitations of the LD Runtime System	Requirement
<p>REGISTRATION PROCESS</p> <p>The LD Runtime has no registration module allowing users to create accounts to access the system. An administrator is needed to create the user accounts.</p>	<p>R1. Provide the system with an automatic User Registration/Authentication Module</p>
<p>UPLOAD UOLS</p> <p>The LD Runtime only allows the administrator to upload UOLs.</p>	<p>R2. Provide the system with functionality for the learner to upload his/her own UOLs.</p> <p>R3. Add the possibility of deleting a UOL. To avoid problems with user privileges this functionality should be restricted to the owner of the UOL.</p>
<p>MANAGING RUNS</p> <p>The runs of the UOLs can only be managed by the administrator in the LD Runtime.</p>	<p>R4. The learner should be able to create their own runs for a particular UOL and to assign a starting date for accessing the course.</p> <p>R5. The learner should be able to access an already created run, previously created by a teacher/administrator/expert or another user of the system.</p> <p>R6. The learner should be able to delete his/her own runs.</p>

3 Using the Link Tool to support auto-management of UOLs

This section presents the Link Tool as a first approach to UOLs management in lifelong learning scenarios, according to the requirements detected in the first Àgora pilot. The initial results of using the Link Tool in a second pilot in the same school are also presented.

3.1 *The Link Tool*

The Link Tool is a web-based application that supports learners in managing their own UOLs. Corresponding to requirement R1 in table I, the tool includes a registration module in the main page that users access when entering for the first time. It also includes a login field for those users who are already registered (Figure 2, top left). Once logged in, the user is presented with a view that mixes some of the functionalities reserved for the administrator role in the LDRuntime environment with those reserved for the user. In accordance with requirement R2, users can upload their own UOLs (Figure 2, top right). These are validated by the system, and if they have no errors they are included in the list of UOLs available (Figure 2, bottom). Users can also delete their own UOLs if necessary (requirement R3).

The Link Tool enables users to manage their *runs*, enabling them to create a run of an existing UOL (requirement R4) or join an existing run (requirement R5) created by other user. This latter functionality is particularly useful in the case of UOLs which include some collaborative activities, or services such as a chat or a forum. For example, if a user creates a UOL with a forum activity and a run associated to it, other users should be able to register on this run in order to access the messages in the forum. Otherwise, each user will be isolated in their own run, and will not see messages from other learners. For such cases the a starting date can be set determining when users can first participate in the run. The owner of a run is able to delete it.

3.2 *Using the Link Tool in a LifeLong Learning context*

To understand how the Link Tool helps in supporting the management of UOLs in a Lifelong learning context, the tool was used in a second pilot carried out in the same Association of Participants Àgora (Santos et al., 2009). The pilot also investigated the benefits of the TENCompetence infrastructure to the school. The main difference between the tooling used in the first and the second pilots was an improvement in the tools available. These were now delivered over the Web and integrated in a Liferay portal. The users accessed to this portal directly from the Web page of the association. As in the 1st pilot, the PDP tool was the central to generating the personal development plans and performing the activities. Some of these activities were UOLs. In this case, the UOLs were managed using the Link Tool instead of the administrator interface of LD runtime system.

Some of the UOLs used in this pilot were repeated from the previous one and new ones were also created by two expert authors. However, in the second pilot each user could freely create their account using the registration module when entering the system for the first time.

The users accessed the UOLs using a link (a URL pointing to the Link Tool) included in the description of the PDP activities. The two experts created a default run for each of the UOLs uploaded by the coordinator starting the same day than the pilot started and

linked directly to that run from the PDP. The link redirected the users to this generic run and they were then able to start following the course. In this way, the users did not have to search for the correct UOL from the list of courses available or login to the system every time. It was also a good solution for those UOLs including collaborative modules such as a forum, in which different users should be included in the same run. When a users wanted to repeat a course, they could access the Link Tool directly with login credentials, select the UOL they wanted to repeat and create their own run. This functionality avoided the necessity of maintaining a list of runs per user and greatly reduced the administration tasks of the course coordinator.

The “linking” URL used in the PDP tool could also contain information such the specific run to be used from among the number of runs available for a UOL as well as the user role for completing the run. This ensures better control in administrating UOL runs in more complex settings.

The results from the first experience show the Link Tool as a good basis for a solution to the administration of UOLs in a Lifelong learning context. On one hand, it provides the learners with some administration functionalities that allow them to freely manage their own courses or repeat a UOL. On the other hand, it facilitates the tasks of the course coordinators who only have to take care of making the UOLs available.

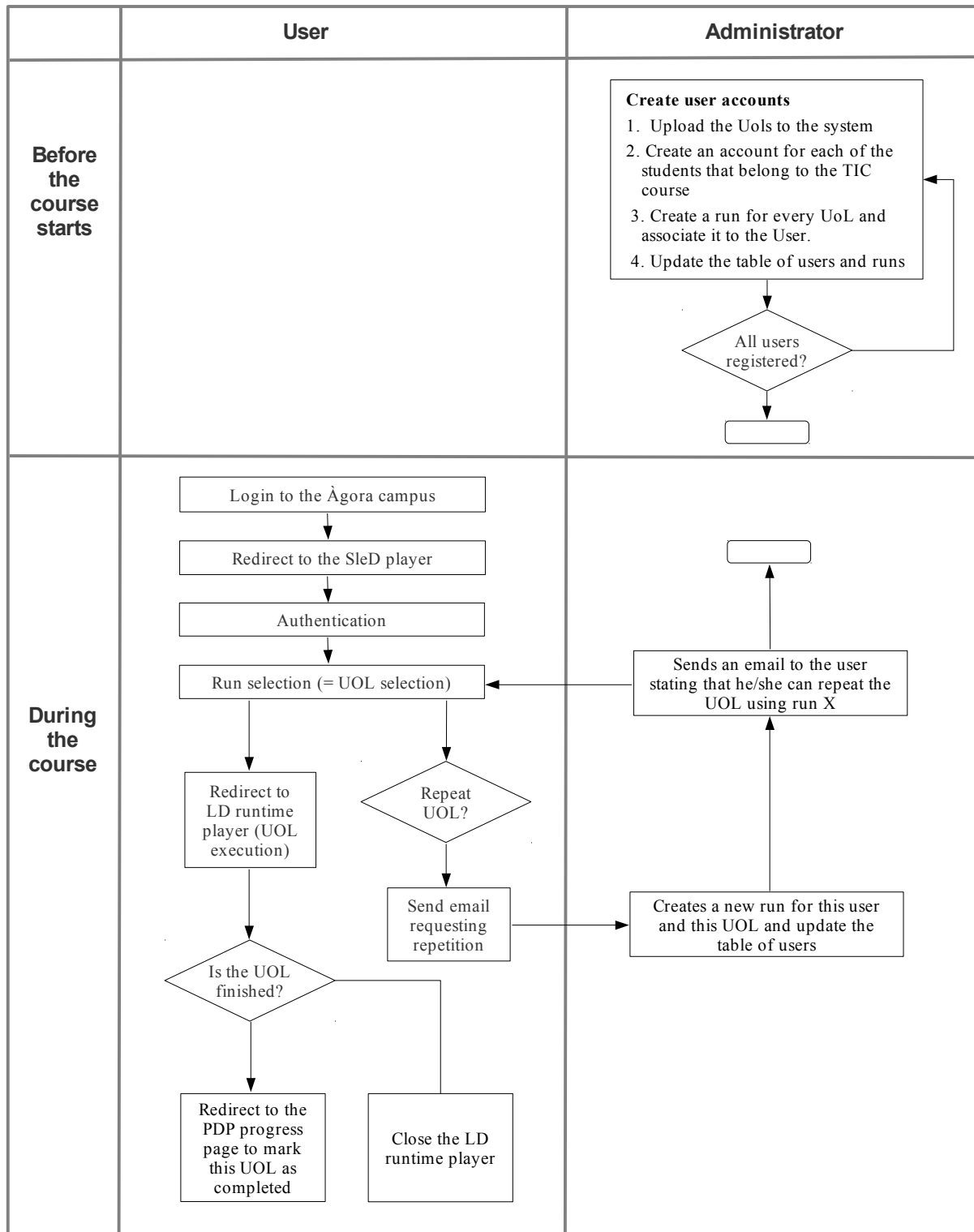


Figure 1 - Flow diagram of the whole process of following a course, from the PDP to the LD Runtime player, and the roles involved in the process.

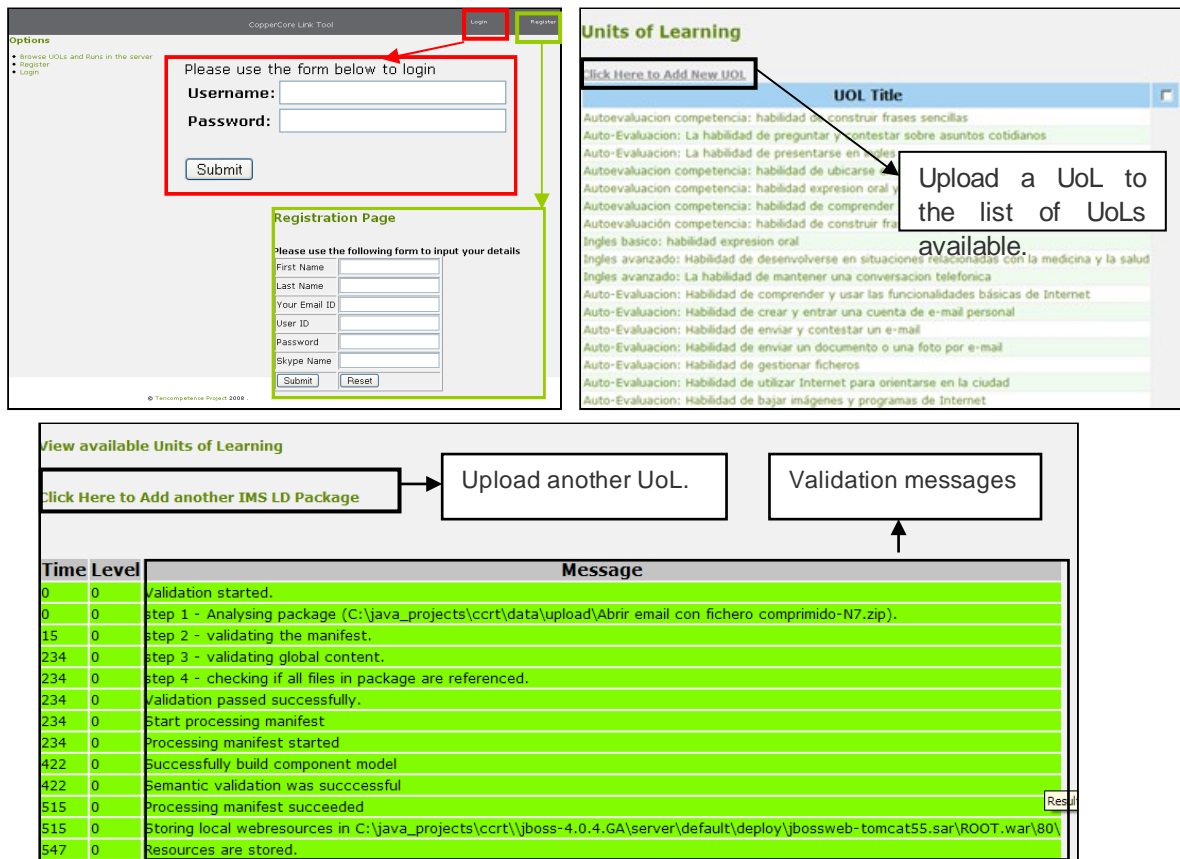


Figure 2 -Screen shots of the Link Tool. Top left: Main page with the registration and login menus. Top right: Page for uploading UOLs. Bottom: Validation page once the UOL is uploaded.

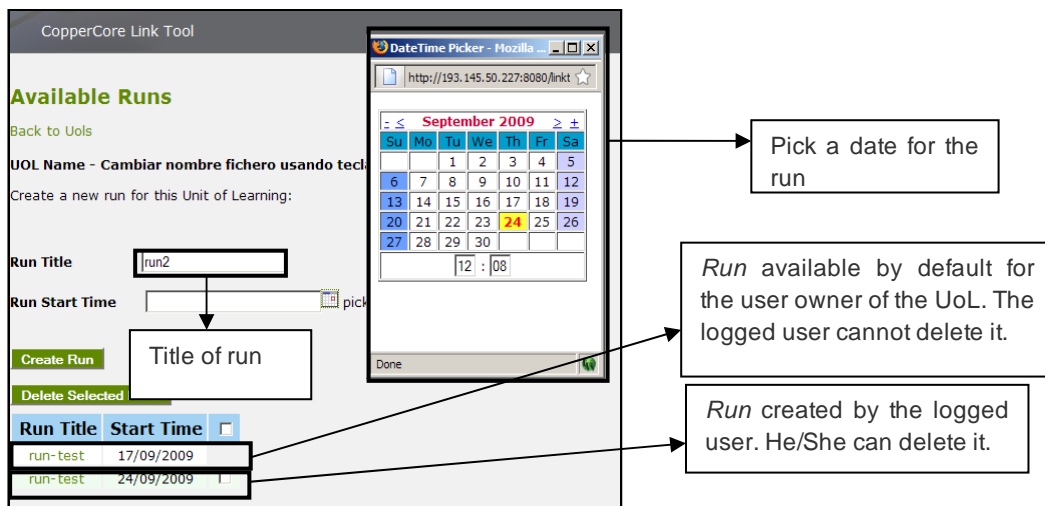


Figure 3 - Screen shot of the page for managing runs. A run can be associated to a date using a calendar.

4 Conclusions and future work

Existing IMS LD tooling falls short in supporting the needs arising from UOL management in lifelong learning contexts. The starting point for this paper was an earlier pilot using the TENCompetence LD runtime and administration tools in the Association of Participants Àgora. The results of this study were a set of requirements that served as a basis for the development of the Link Tool. This new IMS LD compliant tool is an improvement of the LD Admin tool that provides learners with administration functionalities that enable them to manage their own courses. A first trial in the Àgora school has indicated that the Link Tool provides a good basis for the management of UOLs by participants in lifelong learning.

During this trial a number of problems were identified concerning use of the Link Tool. Most of were related to the vocabulary used in the interface and usability aspects. Specific words such as *run* were not well understood by the users. In future versions of the tool, the vocabulary should be adapted to the context and visual aspects of the interface improved.

Currently, the Link Tool is being adapted so that it can be included as a portlet in a Liferay portal and thus integrated with other TENCompetence tools. This new version of the Link Tool will maintain most of the functionality of the current version and resolve some of the usability problems observed during use in Àgora. Integration will involve changes to some of the modules, for example the users will register in the Liferay portal and not to the tool itself. All these new functionalities will be tested in future trials beyond the TENCompetence project to determine if the facilities offered by the Link Tool are sufficient for the management by learners of UOLs in lifelong learning contexts.

Acknowledgement

This work was supported in part by the European Commission in the TENCompetence project IST-2004-02787

References

- Hernández-Gonzalo, J.A., Villasclaras-Fernández, E.D., Hernández-Leo, D., Asensio-Pérez, J.I., & Dimitriadis, Y (2008). InstanceCollage: A Graphical Tool for the Particularization of Role/Group Structures. In *Pattern-Based IMS-LD Collaborative Scripts, Advanced Learning Technologies, IEEE International Conference on*, vol. 0, pp. 506-510.
- Hernández-Leo, D., Bote-Lorenzo, M., Asensio-Perez, J., Gomez-Sanchez, E., Villasclaras-Fernandez, E., Jorrin-Abellan, I., & Dimitriadis, Y. (2007). Free-and Open-Source Software for a Course on Network Management: Authoring and Enactment of Scripts Based on Collaborative Learning Strategies. *IEEE Transactions on Education*, vol. 50, no. 4, pp. 292-301.
- Hernández-Leo, D., Villasclaras-Fernández, E.D., Jorrín-Abellán, I.M., Asensio-Pérez, J.I., Dimitriadis, Y., Ruiz-Requies, I., & Rubia-Avi, B. (2006). Collage, a Collaborative Learning Design Editor Based on Patterns. In *Educational Technology & Society Special Issue on Learning Design*, vol. 9, no. 1, pp. 58-71.
- IMS Global Learning (2003). *IMS Learning Design Best Practice and Implementation Guide, Version 1.0 - final specification*. Retrieved from

http://www.imsglobal.org/learningdesign/ldv1p0/imslld_bestv1p0.html

- Koper, R. and Tattersall, C. 2005, *Learning Design: A Handbook on Modeling and Delivering Networked Education and Training*. Springer Verlag.
- Koper, R., & Olivier, B. (2004). Representing the learning design of units of learning. *Educational Technology & Society*, vol. 7, no. 3, pp. 97-111.
- Louys, A., Hernández-Leo, D., Schoonenboom, J., Lemmers, R., & Pérez- Sanagustín, M. (2009). Self-development of competences for social inclusion using the TENCompetence Infrastructure. *Journal of Educational Technology and Society* (12)3, pp. 70-81.
- Moodle, *Website*. Retrieved November 20, 2009, from <http://moodle.org/>
- Santos, P., Llobet, W., Hernández-Leo, D., & Blat, J., (2009). *QTI for self-assessment and embedded assessment in competence oriented scenarios: The Agora Case*. Proceedings of the 2009 International Conference on Intelligent Networking and Collaborative Systems (INCoS 2009). pp. 38-45. IEEE Computer Society, Washington DC.
- Tattersall, C., Vogten, H., Brouns, F., Koper, R., Van Rosmalen, P., Sloep, P. & Van Bruggen, J. (2005). How to create flexible runtime delivery of distance learning courses. *Journal of Educational Technology and Society* (8)3, pp. 226.
- TENCompetence (2009a). LD Runtime Website. Retrieved October 20, 2009, from <http://www.tencompetence.org/ldruntime/>
- TENCompetence (2009b). Recourse Website. Retrieved October 20, 2009, from <http://www.tencompetence.org/ldauthor/>

Using TENCompetence tools: experiences from on line competence based learning in Hydroinformatics at UNESCO-IHE

Andreja Jonoski, Ioana Popescu and Carel Keul

UNESCO-IHE Institute for Water Education, Department of Hydroinformatics and Knowledge management, P.O. Box 3015, 2601 DA, Delft, The Netherlands

E-mail: a.jonoski@unesco-ihe.org

Abstract: UNESCO-IHE, an international academic institute dedicated to water-related postgraduate education, is facing new challenges in offering life long learning services and online educational support. The institute has participated in the European Union (EU) TENCompetence Project as a pilot partner, responsible for carrying out two pilot on-line competence-based courses from the field of Hydroinformatics. The pilots were used for introduction of the competence-based learning concepts as well as for testing the supporting learning infrastructure developed within the TENCompetence project. This process has confronted the organisation with questions regarding:

- a) Education design and support
- b) ICT infrastructure support
- c) Organisational impact of competence based learning
- d) Future strategy for life long learning of water professionals

In this paper we will briefly address the first two aspects, based on the experiences with the two Hydroinformatics on-line courses. A description is given of the approach taken for the redesign of an originally topic-driven course into a competence-based learning course. The evaluation of the participants of the new method of learning is presented in the paper with focus on tool usage and learning experience.

Keywords: online education; competence-based learning; hydroinformatics; flood modelling; decision support systems

1 Introduction

UNESCO-IHE is a water education institute providing MSc and PhD education, a large number of short courses, online courses and tailor made courses. Mid-career participants from all over the world come to the Institute for one of the 4 MSc programmes (including 14 specialisations), while many others come for short or online courses. Currently UNESCO-IHE offers 14 online courses in a variety of topics.

The institute has participated in the European Union (EU) TENCompetence Project as a pilot partner, responsible for carrying out two pilot online competence-based courses in the field of Hydroinformatics. The pilots were used for introduction of the [9] Louys, A., Hernández-Leo, D., Schoonenboom, J., Lemmers, R., & Pérez- Sanagustín, M. competence-based learning concepts, as well as for testing the supporting learning infrastructure developed within the TENCompetence project.

In this paper we will describe our specific pilot experiences with two online courses: the “Flood Modelling for Management” (FMM) and the “Decision Support in River Basin

Management” (DSS). The presentation is structured in the following sections:

- The pilot context
- The adaptations of the existing hydroinformatics online modules towards competence-based courses needed to match the available learning support tools from TENCompetence
- An overview of the used TENCompetence tools
- The experience of the used tools by the participants
- Conclusions and discussion

2 The pilot context

2.1 *European context of learning*

Since 1999, the implementation of the Bologna declaration brought many changes in the European Higher Education Area including a significant adaptation of universities' curricula. The most important of those changes are the introduction of a European Credit Transfer System (ECTS) and the levelling of Bachelor and Master level education. The Bachelor level is intended to give direct access to the labour market and employment, whereas the Master degree should be a specialisation. Doctoral studies (PhD) have been introduced as a third level. Learning outcomes and the competencies associated with Bachelor and Master degrees are basic parameters used for comparing higher education between different universities and different countries.

In addition to these changes in higher education, the Bologna declaration recognised the crucial need for life-long learning and professional development (European Ministers in charge of Higher Education, 2001). This reflects the European agenda to stimulate lifelong learning as expressed in other national and international policy documents. In the European Commission's memorandum on Lifelong Learning (2000) it is stated that: "Lifelong Learning is no longer just one aspect of education and training; it must become the guiding principle for provision and participation across the full continuum of learning contexts". Lifelong learning refers to the activities people perform throughout their life to improve their knowledge, skills and competence in a particular field, given some personal, societal or employment related motives (Aspin & Chapman, 2000; Field, 2001; Griffin, 1999).

2.2 *TENCompetence project and the pilot of UNESCO-IHE*

Within the context described above UNESCO-IHE is becoming aware of the continuous tension between academic educational offerings and the professional competence development of those who work in the professional water sector. To better address the new demand participants will need to be offered more flexibility in their learning paths in the future. The search for appropriate approaches to flexibilisation of water education is a long term process which requires development and testing with actual participants as learners.

One valuable opportunity for such testing was opened to UNESCO-IHE via its participation in the TENCompetence research project. TENCompetence is a 4-year EU-funded project that develops a technical and organizational infrastructure for lifelong competence development. With this freely available infrastructure the European Union aims to boost the European ambitions of competence-based, lifelong learning. Within the project this infrastructure was tested via a number of pilots in different professional fields, through which some answers could be provided to the challenging

questions mentioned above.

Attracted by the overall objective of TENCompetence “to meet the needs of users (individuals, groups and organisations in Europe) for lifelong competence development by establishing the best infrastructure which is possible today, using open-source, standards-based, sustainable and extensible technology” (Koper, 2006), UNESCO-IHE participated as one of the pilot partners of this project in the period of December 2006 - December 2009. This participation comprised of using and testing the available TENCompetence tools belonging to the overall infrastructure, within two online course pilots: the 'Flood Modelling for Management' (FMM) and the 'Decision Support in River Basin Management' (DSS),

At the start of the pilot (end 2006) UNESCO-IHE had already built up some three year experience with virtual learning through its existing Learning Management System (LMS). This system was stable and was not much integrated into the wider ICT infrastructure of the Institute (separated from student administration and enrolment, email, forum, document storage, no grading system, etc.). The system also assumes a teacher-centred approach, offering a fully structured curriculum that the participants just have to follow. In general all educational courses that are offered are ‘topic-based’, rather than competence-based’.

The TENCompetence Project developed and tested its framework during three pilot cycles (2007, 2008, 2009). UNESCO-IHE was part of cycle 2 (2008) and 3 (2009), building on the experiences of Cycle 1 (Schoonenboom *et al.*, 2008). Unfortunately the integration of tools has not been achieved during our pilots. Only a few tools were available and only during the second run of the pilots (May 2009), a more integrated environment became available,

The implementation of the pilots was influenced by two important design decisions during the project:

1. The Personal Competence Manager (PCM, a downloadable rich client application), developed during cycle 1, was redirected "towards the implementation of distinct usage profiles". In practice this meant that development was stopped and that it had to be replaced by a group of simpler client applications for specific usage profiles, like 'I want to follow a course'. The Personal Development Planner (PDP) was one of the first separated clients. During Cycle 2 the first pilot used and tested the PDP. The PDP also made use of a blog facility.
2. The next major design decision was that separate tools (available and to be developed) would be redesigned to web based applications and integrated into a web portal, using the open source portal technology of Liferay. The second pilot of UNESCO-IHE, during cycle 3, used Liferay as entrance to the TENCompetence infrastructure.

As a result UNESCO-IHE has used some TENCompetence tools under various conditions: as separate client programs, and as part of a portal environment.

During the second pilot (2009) the institute has taken the decision to replace the 'old' LMS by a platform based on Moodle, which is a proven (open source) technology and can be easily used by partners in developing countries. The TENCompetence infrastructure will not be used further for 'running courses' at UNESCO-IHE. Nevertheless the infrastructure may offer a lot more in the perspective of life long learning support for professionals.

3 Towards competence-based hydroinformatics education

The concepts of Hydroinformatics as a new and distinct academic discipline were conceived and implemented by Professor Michael B. Abbott (Abbott, 1991). Hydroinformatics is broadly defined as the application of modern information technologies to the solution of problems associated with the aquatic environment.

The Hydroinformatics Masters course at UNESCO-IHE aims at enriching traditional engineering practice by introducing innovative approaches in order to open up for the students much broader perspectives. The course introduces students to the process of developing mathematical models as a means for solving real problems, and their embedding in Decision Support Systems (DSSs). In the past decade, much focus has been placed on DSSs for stakeholder involvement in planning and management of water and environmental systems (Abbott & Jonoski, 1998)

The volume of information that hydroinformaticians are called upon to know is increasing far more rapidly than the ability of engineering curricula to “cover it.” Now the graduates are increasingly finding employment in non-traditional (hydraulic engineering) fields, such as computer engineering, environmental science, health and safety engineering, and even business and finance. To be effective across this broad spectrum of employment possibilities, the graduates should understand concepts in physics, mathematics, ecology, geography, computer and software engineering that are well beyond the range of the traditional hydraulic engineering curriculum. (For more information on the transition from classical hydraulic engineering education towards hydroinformatics education, particularly as developed at UNESCO-IHE (Abbott & Minns, 1994; Odgaard, 2001; Price *et al.*, 2006).

For these reasons, the curriculum needs to be structured in a way which meets the needs of most students. One approach is to institute multiple flexible tracks for different areas of specialisation. The first step in this process is the introduction of learning *modules*. A module contains a coherent cluster of subjects, which are usually thematically connected. The content of the course is then made flexible by introducing sets of several elective modules organised in tracks, such as “Urban systems modeling”, “Environmental systems modeling” and “Flood modeling for management” tracks. These tracks match with specific professional fields of work.

Some of the developed hydroinformatics modules are also being adapted to be offered as stand-alone online courses (Price *et al.*, 2007). Since these online courses are commonly offered to water professionals they are particularly suited for researching new educational approaches for life long learning and professional development, such as the competence-based learning. The two courses chosen as pilots within TENCompetence are in fact such existing online courses.

A necessary task for implementation of the two pilots in this framework is the redesign of the existing online courses into competence-based courses. The competence model adopted by UNESCO-IHE for the FMM and DSS pilots is the model of Cheetham and Chivers (Cheetham & Chivers, 2005). This model stresses the importance of developing professionals in four well-balanced and integrated domains: the cognitive, the vocational skills, the personal competencies, and the ethic / values domains. Once competences have been developed they have been mapped into competence profiles following the TENCompetence approach.

The FMM course is given as an example of the transformation of the course from the original set-up into a competence-based course.

The original FMM course was based on four related and sequential course topics:

1. Flood management and information technology
2. Flood processes
3. Flood modelling: methods and techniques
4. Flood modelling: advanced features

Each of these topics has several sub-topics associated with various assignments.

The learning path for the four main topics of the FMM course is teacher-centred, because the participants of the course have to follow the subjects in a pre-defined defined order. During the course re-definition the FMM content was disaggregated according to the core competence model elements of Cheetham and Chivers. For example, a sub-topic in the first topic associated with the assignment of “Finding flood resources on the web”, was classified as tacit/practical competence in the knowledge competence category, while learning how to build a model and doing data analyses (parts of original topic 3) were categorised as being part of the functional competencies. A detailed mapping of the initial FMM topics into competences is given in the TENCompetence Report on the results of the evaluation of the Cycle 2 pilots (Hernández-Leo *et al.*, 2009).

Figure 1 shows the final mapping of the FMM competencies according to the Cheetham and Chivers model as developed for the student-centred perspective that was implemented in FMM02.

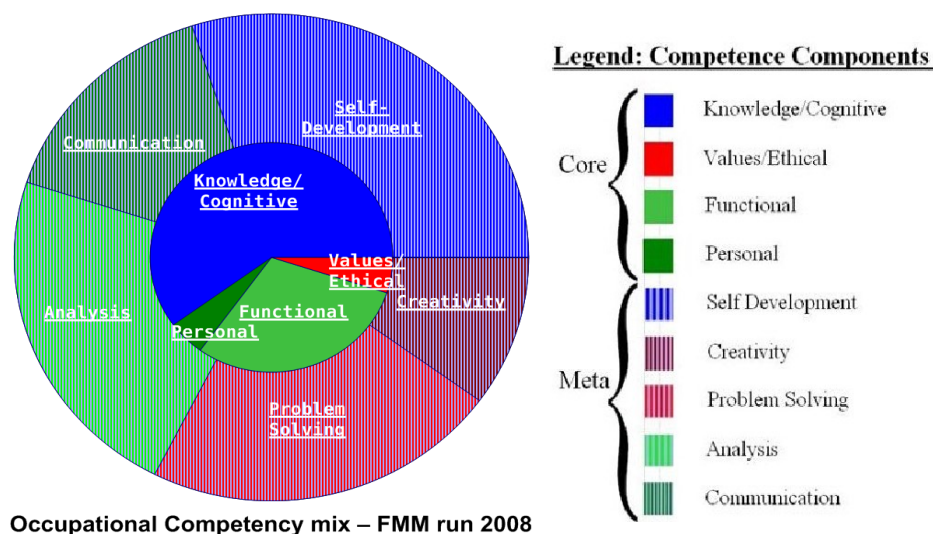


Figure 1: Mapping of the FMM02 competences

4 TENCompetence Pilot Infrastructure

The infrastructure of TENCompetence consists of a variety of different tools, grouped as Learner tools and Author tools. Not all of these tools were available in the period of running the UNESCO-IHE pilots. An overview of tools availability and the use of tools in the pilots are presented in Table 1.

Table 1: Overview of TENCompetence Tool availability and use

TENCompetence tools	Available	Used in UNESCO-IHE pilots
<i>Author tools</i>		
• Learning Path Manager and Editor	No	
• ReCourse Wysiwyg XHTML editor	Yes	No
• Test Editor	No	No
<i>Learner Tools</i>		
• My ePortfolio	No	No
• The Graphical Planning Tool	No	No
• User-Profile Editor	No	No
• Search activities, competences & Learning Paths	No	No
• TENTube	Yes	No
• Hybrid Personaliser	No	No
• LearnWeb	Yes	Yes
• PDP Web Tool	Yes	Yes
• Overview Tool	No	No

The pilot runs are given in Table 2. During the pilot period the FMM course was delivered twice. During the second run participants were offered a more flexible learning path. The DSS course was run once and was focusing on the possibilities to increase the participation of African water professionals from the Nile basin countries.

Table 2: TENCompetence UNESCO-IHE Pilots

Course	Start	End	Objective	TENCompetence Tools
FMM01	24 Sept 2008	1 December 2008	Teacher centred approach	PCM and the PDP (Rich client)
FMM02	27 May 2009	24 July 2009	Student centred approach	Web PDP, LearnWeb 2, Liferay
DSS	11 May 2009	13 July 2009	Community development	Web PDP, LearnWeb 2, Liferay

The support offered by the TENCompetence tools, as specified in Table 1, was as follows:

1. New pedagogical & organisational models for Lifelong Competence Development. This support was primarily offered by the PCM database, which was used for structuring and organising the competencies within the competence profile
2. Support for individuals to search the most suitable formal & informal learning activities. This was provided primarily through the WebPDP, although the Liferay Portal and the LearnWeb tools offered support by enabling peer learning
3. Pro-active sharing of resources. LearnWeb was the primary tool

4. Provision of various forms of user support services. Liferay portal served as a primary integrator of various user support services.

The developed and available infrastructure in 2009 was different from the tools used in 2008. In 2008 (for FMM01) all participants had to download the Personal Development Planner (PDP), install it and configure it. In 2009 PDP was developed as a web-based application (WebPDP) accessible via a browser. For the runs in 2009 (FMM02 and DSS) the following tools were used:

- The PCM (Personal Competence Manager) tool and its underlying database were used to create the closed Course Community, to register the participants for the Community, to create the competence profiles and the competences.
- The PDP was used to create activities and associate them to the competences and also for the users to create their Competence Development Plans and to blog their progress.
- The Liferay Portal environment, under which the PDP and LearnWeb were implemented, meant a large improvement regarding the coherence of the tools and the communication facilities for the participants and the staff.
- Course material was offered via hyperlinks to a secure UNESCO-IHE web server .

Nevertheless, the available infrastructure that was offered comprised only a part of the expected available tools through the TENCompetence Infrastructure.

5 Evaluation of the UNESCO-IHE pilots in 2009: FMM and DSS

In the following presentation we will not compare the FMM01 and FMM02 pilot. As mentioned earlier, the infrastructure was very different in the two runs, although the course content material was the same. We will focus our presentation on the 2009 runs (FMM02 and DSS), particularly on experiences of the infrastructure by the participants as they are related to the TENCompetence objectives:

- Facilities used for learning
- Competence development, navigation guidance, control over learning

Before and after each pilot the participants were requested to fill in an online questionnaire. The participants were asked about their background and opinions on aspects of learning and tool usage. The questionnaire was a compulsory activity. The results are based on these questionnaires.⁷

⁷ All results referred to in this paper are published in reports at <http://dspace.ou.nl/handle/1820/501>

5.1 Facilities used for learning

In the 2009 runs, the Liferay Portal environment was used for both the FMM02 and the DSS pilot. In this way the results from the pre and post-course questionnaire can be used for reference. The basic environment consisted of an entrance website (Liferay Portal), where participants - after login - were introduced to the course, and accessed a Calendar, Forum, PDP, LearnWeb and Participant Profiles. The core of the course was the use of the PDP in which the learning plan was divided into competencies. Each competence was related to specific course material (lectures with audio/video, lecture notes and articles, downloadable software, assignments). Per competence each participant was enabled to blog about her or his progress. Although the PDP also offers the possibility to carrying out a self-assessment, this option is not discussed here, since not many participants made use of it.

Use of Blogging

From Tables 3 and 4 it can be seen that public blogging was seen favourably by the FMM02 and the DSS participants.

Within the DSS pilot (N=41) participants differed widely in the number of times that they created a new shared blog entry or updated an existing one. The average is more than 14 blogs. 82,9% of the 41 participants also rated the use of the blog as (very) useful, 12,2% as neutral, and 4,9% as useless.

Within the FMM pilot (N=37) participants also differed widely in the number of times that they created a new shared blog entry or updated an existing one. The average is almost 11 blogs. 73% of the 37 participants also rated the use of the blog as (very) useful, 18 % as neutral, and 8 % as useless.

Table 3: Private Blogging

Private Blogging	FMM02		DSS	
	%	#	%	#
<i>Did you create and use private (non-shared) entries in PDP? For what purpose?</i>				
I didn't create and use private blog entries	70.3%	26	65.9%	27
I used private blog entries to reflect on my progress	21.6%	8	22.0%	9
I used private blog entries for other reasons, namely.....	8.1%	3	12.2%	5

Table 4: Public Blogging

Public Blogging	FMM02	DSS
	N=37	N=41
Average number of blogs	11	14
Blogging rated as (very) useful	73 %	83 %
Blogging rated as neutral	18 %	12 %
Blogging rated as useless	8 %	5

Use of Forum

As seen from Table 5, within the FMM02 pilot the forum in Liferay was not used by 46%

Using TenCompetence tools: experiences from on line competence based learning in Hydroinformatics at UNESCO-IHE

of the participants, while within the DSS pilot is was used some more. Nevertheless, the majority of FMM02 participants (almost 60%) think that the Forum is (very) useful. This includes those who did not use the Forum themselves. A larger majority of the DSS pilot (more than 80%) think that the Forum is (very) useful. Again here this percentage includes those who did not use the Forum.

Table 5: Forum usage

Forum usage	FMM02		DSS	
	N = 37		N=41	
<i>For which purposes did you use the Forum in Liferay?</i>	%	#	%	#
I didn't use the forum	45.9%	17	36.6%	15
I used it to seek help on the PDP	35.1%	13	43.9%	18
I used it to be informed about the new activities	13.5%	5	31.7%	13
I think it will be useful in the future when I work from home and I need some advice/help	5.4%	2	22.0%	9
I think it will be useful in the future when I work from home and I want to be updated about the latest news regarding the tools and activities	5.4%	2	9.8%	4
Other purposes	8.1%	3	7.3%	

Use of LearnWeb

LearnWeb was offered as an optional tool. It is developed and meant for professionals to share knowledge resources on the web. It offers the possibility to add (hyperlinked) resources from YouTube, etc., as well as features as 'rating'.

Table 6: LearnWeb usage

LearnWeb usage	FMM02		DSS	
	N = 37		N = 41	
<i>For what purposes did you use LearnWeb?</i>	%	#	%	#
To find additional resources for working on my competences	45.9%	17	36.6%	15
To find other resources that would be useful for me	35.1%	13	61.0%	25
To find resources that would be useful to someone else	8.1%	3	4.9%	2
Did not use it	21.6%	8	19.5%	8

Within the FMM02 pilot 'rating' of added knowledge resources was used by about 1/3 of the participants. Within the DSS pilot almost 1/2 of the participants used 'rating' (see Table 6).

In both pilots, about 55% of those who used LearnWeb found it a useful tool for search new resources, to share resources with your classmate/workmate and/or to rate and evaluate resources. There were, however, numerous comments on how it could be improved. Currently a new release has been published, which was not available at the moment of the pilot.

5.2

Appreciation of collaboration

We asked the participants to score six statements regarding collaboration on a five-point scale. The five point scale was associated with the following linguistic evaluation: {I agree completely - 5 points}; {I agree - 4 points}; {I neither agree nor disagree - 3 points}; {I disagree - 2 points}; {I disagree completely - 1 point}. When taking into account the sum of “completely agree” and “agree” response percentages, we see that as a whole almost half of the participants tend to agree on having had good collaboration (Table 7).

Table 7: Appreciation of Collaboration

Appreciation of collaboration	FMM02	DSS
What is your opinion on collaborative aspects during the course?	Sum of “Completely agree” and “agree” response percentages	
I had lively and stimulating discussions with other participants in the pilot.	33.4%	45.2%
I learned a lot from other participants in the pilots.	43.2%	52.4%
Other participants in the pilot were able to answer my questions.	48.6%	61.9%
I provided useful help to other participants in the pilot.	45.9%	33.4%
I had feedback that this help to other participants in the pilot was useful.	48.6%	35.7%

Within the FMM02 pilot we see that overall participants tend to agree on having had good collaboration. We see that ‘I had lively and stimulating discussions with other participants in the pilot’ has relatively the lowest score, but still one third (completely) agree. Within the DSS Pilot as a whole 45, 2% participants tend to (completely) agree on having had good collaboration.

5.3 Competence development, navigation guidance, control over learning

In the description of the pilot and their results we will focus on the aspects of competence development, expressed needs on freedom of learning sequences, as well as the feeling of control over one’s own learning process.

Competence development

In the pre-test questionnaire participants were asked how important it was for them to acquire certain competences. We have shortened the result to those who expressed their opinion in terms of “very important” or “important” (Table 8).

For both pilots we see that before the courses started almost all participants considered that most competences are (very) important to acquire. Only social skills have a somewhat lower score. After the course (post-test) it appears that, also in both courses, most experiences were related to cognitive competence components, while there was least emphasis on learning social skills.

Table 8: Importance of competences in pre- and post-questionnaires

Importance of competences	FMM02 Pre-test	FMM02 Post-test	DSS Pre-test	DSS Post-test
<i>Pre-test: How important is it for you to acquire the following types of competences?</i>				
<i>Post- test: How much have you learned with respect to the following types of competences?</i>	N=63	N=37	N=105	N=42
Cognitive knowledge	92.1%	89.2%	95.2%	92.8%
Functional skills	96.8%	67.6%	97.1%	81.0%
Social skills	79.0%	34.3%	87.5%	26.1%
Knowing how to behave according to the rules and values of the profession	90.5%	37.8%	90.4%	50.0%
Knowing how to guide my future use by reflection on current practice	88.9%	70.3%	99.0%	83.3%
Knowing how to find creative solutions for problems related to this competence	98.4%	70.2%	99.0%	76.2%

Navigating learning paths

At the beginning of each pilot a pre-test questionnaire was submitted by all participants regarding their initial opinion and situation. One of the questions concerned their ideas on 'supportive learning'. This is the dimension that ranges from completely self-steering to being guided by the system with little choice. The first section of the questionnaire was an introduction: “The course will provide you with a diversity of web-based learning resources. In addition, your learning can be supported in several ways. We can outline a path for you, we can ask you to follow a specific learning path, or we can give you the freedom to follow your own path.” (For DSS pilot the path was pre-determined, but still the preference of the participants was asked)

After this, one of three possibilities could be selected on the basis of the question: “What would be most supportive for your learning?”. The results are provided in Table 9.

Table 9: Pre-test preference for 'supportive learning'

Navigation	FMM02		DSS	
	N = 63		N = 104	
	#	%	#	%
Learning resources only	3	4.8%	5	4.8%
Learning resources + outline path + choose own path	47	74.6%	76	73.1%
Learning resources + outline path to be followed	13	20.6%	23	22.1

Within both pilots a majority interprets 'supportive learning' as a mix of guidance and freedom. In the post-test questionnaire participants were again asked about their preference regarding freedom in learning path sequences. The results are presented in

Table 10.

Table 10: Post-test preference for 'supportive learning'

Post-test preference for 'supportive learning'	FMM02		DSS	
<i>In this course UNESCO-IHE provided you with an activity plan (the plan and sequence of learning activities).</i>	N = 37		N = 41	
<i>Would you prefer to have more freedom yourself in choosing the sequence of activities?</i>	%	N	%	#
I prefer to be given some freedom in choosing between learning activities. So, e.g. I can choose to work on 3.2 or 4.1 whenever I like, instead of 'first 3.2 and later 4.1'.	29.7%	11	38.1%	16
I want to be able to define as much as possible my own learning path. The lecture should only inform me if certain learning activities have specific requirements (e.g. you cannot do 4.3 before you finished 3.2)	27.0%	10	35.7%	15
I prefer the lecturer to define the whole sequence of learning activities. I just follow his/her learning path	43.2%	16	26.2%	11
I prefer to be given some freedom in choosing between learning activities. So, e.g. I can choose to work on 3.2 or 4.1 whenever I like, instead of 'first 3.2 and later 4.1'.	29.7%	11	38.1%	16

For the FMM pilot we see distributed preferences with somewhat more preference for being guided by the lecturer. This is surprising, since this pilot enabled more freedom for the participants to choose their learning path.

For the DSS pilot we see distributed preferences with somewhat more preference for freedom rather than being guided by the lecturer (which was more the case in the FMM-pilot).

Control over learning

Table 11. Control over learning experience

Control over learning experience	FMM02 (N=37)	DSS (N=42)
<i>What is your opinion on the level of control you experienced over your learning process?</i>	Sum of "Completely agree" and "agree" response percentages	
In the beginning, I quickly got an overview of the competences involved and my current proficiency level.	58.3%	66.7%
I had a good overview on what I had done and what I had to do.	70.3%	76.2%
I had insight into how my learning progressed.	69.4%	71.4%
I had the feeling that I learned exactly what I wanted to learn.	59.4%	71.4%
I had the feeling that I could plan my own learning.	64.9%	61.9%
I felt in control of my own learning.	58.3%	66.70%

In the post-test questionnaire participants were asked their about the level of control

they experienced over their learning process, again using a five-point scale associated with a linguistic evaluation: {*I agree completely* - 5 points}; {*I agree* - 4 points}; {*I neither agree nor disagree* - 3 points}; {*I disagree* - 2 points}; {*I disagree completely* - 1 point}. In Table 10 we present the *sum* of “*completely agree*” and “*agree*” response percentages.

In table 11 we see that for both the FMM02 and DSS pilot we see that a majority (completely) agrees on the different aspects (average about 65%). Regarding the feeling of being in control, the DSS participants appear to have this more intensely.

6 Conclusions and discussion

The overall conclusion from the two pilots about the participants’ learning experience is quite positive. Although the learning environment was new for the participants they have adapted quite quickly. The components of the TENCompetence learning infrastructure that were tested during the FMM and DSS pilots were well integrated within the Liferay portal, which provided a coherent and effective learning experience.

The collaboration potential of the tools was overall appreciated well by the participants. The Blogging and Forum tools were used and highly appreciated by the participants in both analysed pilots, whereas the LearnWeb tool for sharing of resources was used less, most likely because of the quality of the intermediate version available at the time of the pilot runs. The overall experience of collaboration was high.

The successful implementation of the DSS and FMM course has also shown the potential of the competence-based learning approach. Despite the success there are remain ongoing issues that need continue attention. One of the major issues with the competence-based online courses is the cost of developing and adaptation of online course material. This starts with the redesign of existing courses (with learning objectives) into a course that leads to attainment of sets of competencies. Once the competencies are developed and mapped into competence profiles, one of the crucial issues is that of learning paths. Experience with these pilots, as also demonstrated in the evaluation results on navigation of learning paths and control over learning, indicates that the preference may be somewhere in the middle between the two extremes of completely teacher-specified learning path and free-choice learning path.

It is quite clear that the involvement of UNESCO-IHE in the TENCompetence pilot has raised interesting didactical, organisational and technical issues regarding the (future) support of life long learning for water professionals all over the world. The most important of these issues can be summarised as follows:

- On the didactical side, a major question remains the appropriate level of disaggregation of existing content in order to structure it in clear and attainable competencies and competence profiles. Although this process is primarily content dependent, it is clear that when dealing with participants from all over the world, even if entry requirements are well specified, the starting level of the participants can vary widely and become a significant factor in attaining the competencies. This observation points towards development of different levels of competencies within same topic, and more extensive use of self-assessment. This was not the case in the current pilots and remains a task for the future.
- Organisationally, there is a clear need for more integrated infrastructure of tools to support learning. Our experience is that major improvements were

implemented within TENCompetence between cycle 2 and cycle 3. However, even within the cycle 3 pilots that are analysed here, full integration was not achieved. Nevertheless the pilots were run successfully, thanks to the dedication of the TENCompetence partners involved in maintaining the infrastructure. From the point of view of UNESCO-IHE it is necessary that any such learning infrastructure should be fully integrated within the wider ICT infrastructure of the Institute (e.g. student administration and enrolment).

- Future technical challenges are related to two aspects. The first is the quality and integration of the software tools themselves - a process that needs to continue beyond the level attained within the TENCompetence research project. A second aspect which becomes very important when dealing with participants from all over the world (and particularly from developing countries) is related to the speed and quality of Internet connections, which still vary widely. Even with the continuous improvements on this front, many technical problems arise because of these differences. Approaches for 'light versions' of the learning supporting tools, which can function across slower Internet connections may need to be considered, if participants from these areas are not to be left behind.

Finally, it needs to be stressed that the conclusions from these pilots are still somewhat confined to the topics (FMM and DSS) and types of participants (world wide) that were considered. They are not easily generalised for different situations. With respect to the TENCompetence learning infrastructure, additional analysis *across* all the implemented pilots may provide more general insights.

7 References

- Abbott, M. (1991) *Information technology and the aquatic environment*. Aldershot, UK/Brookfield, USA: Ashgate.
- Abbott, M., & Jonoski, A. (1998) *Promoting collaborative decision-making through electronic networking*. 3rd Int. Conference on Hydroinformatics, Copenhagen, Denmark.
- Abbott, M., & Minns, A. (1994) Education and training in hydroinformatics. *Journal of Hydraulic Research* (32), pp. 203 - 214.
- Aspin, D., & Chapman, J. (2000) Values education and the humanization of the curriculum. In: M. Leicester, Modgil C., & Modgil, S. (Eds.) *Education, culture and values* (vol VI). London: Falmer.
- Cheetam, G., & Chivers, G. (2005) *Competence and informal learning*. Edward Elgar Press.
- Commission of the European Communities (2000) *A memorandum on lifelong learning*. Commission Staff Working Paper SEC(2000) 1832. Retrieved from <http://www.bologna-berlin2003.de/pdf/MemorandumEng.pdf>
- European Ministers in Charge of Higher Education (2001) *Towards the European higher education area*. Communiqué of the meeting of European Ministers in charge of Higher Education, Prague, May 19th 2001. Retrieved from <http://www.bologna.msmt.cz/PragueSummit/Prague%20Communique%20-%2019-05-2001-FINAL.doc>.
- Field, J. (2001) Lifelong education. *International Journal of Lifelong Education* (20)1-2,

pp. 3-15.

- Griffin, C. (1999) Lifelong learning and social democracy. *International Journal of Lifelong Education* 18(5), 329-42.
- Hernández-Leo, D., Pérez, M., Chacón, J., Melero, J., Sayago, S., Stefanov, K., Keuls, C., Glas, W., Popescu, I., Louys, A., Schoonenboom, J., Specht, M., Glahn, C. & Lemmers, R. (2009) *D4.4 - report on the results of the evaluation of the cycle 2 pilots*. Retrieved from <http://dspace.ou.nl/handle/1820/1719>
- Koper, R. (2006) Stimulating competence development of individuals and organisations in europe. Heerlen, Open University of the Netherlands.
<http://dspace.ou.nl/bitstream/1820/450/1/online-educa-keynote.pdf>
- Odgaard, A. J. (2001) Trends and current developments in hydraulic engineering. In N. C. T. University (Ed.) Keynote lecture. Republic Taiwan of China
- Price, R. K., Bhattacharya, B., Popescu, I. & Jonoski, A. (2007) Flood modeling for management: UNESCO-IHE's online course in hydrology. *Bulletin of World Meteorological Organisation*.
- Price, R. K., Popescu, I., Jonoski, A. & Solomatine, D. (2006) *Fifteen years of experience in hydroinformatics at UNESCO-IHE Institute for Water Education*. Paper presented at the 7th International Conference on Hydroinformatics HIC 2006, Nice, France.
- Schoonenboom, J., Sligte, H., Moghnieh, A., Hernández-Leo, D., Stefanov, K., Glahn, C., Specht, M., & Lemmers, R. (2008) Supporting life-long competence development using the tencompetence infrastructure: A first experiment. *International Journal of Emerging Technologies in Learning*, 3(1), 53-59.

Enhancing competence development for social inclusion using the TENCompetence Web tools

Amélie Louys¹, Davinia Hernández-Leo², Henk W. Sligte³, Mar Pérez-Sanagustín² and Judith Schoonenboom³

1. Association of Participants Àgora, C/Selva de Mar, 215 5^a planta, 08020 Barcelona, Spain
2. ICT Department, Universitat Pompeu Fabra, C/ Tanger 122-140 08018- Barcelona, Spain
3. SCO-Kohnstamm Institute, University of Amsterdam, P.O. Box 94208, NL-1090 GE Amsterdam, The Netherlands

E-mail: agora@edaverneda.org

Abstract: This paper describes two pilot studies centred on technology-enhanced competence development in lifelong education, carried out in the challenging context of the Association of Participants Àgora. The comparison between the studies reinforces the conclusion drawn from the first pilot experience, which indicates that the use of the TENCompetence infrastructure provides significant learning benefits for adult participants with low educational profiles and who are traditionally excluded from the use of innovative learning technologies and the knowledge society. The participants had the opportunity to develop and improve competences related to English language, ICT and Basic Spanish (second pilot only). The tools employed switched from a rich client application to a Web client which also integrated new functionality related to self-assessment, activity organization and resource sharing. The paper introduces the context and the pilot scenario, indicates the evaluation methodology applied and discusses the most significant findings and the comparison of the two pilot studies. The results of the second pilot reinforce the conclusion that TENCompetence provides a relevant solution for competence development in support of social inclusion.

Keywords: lifelong competence development; self-organized learning; social inclusion; pilot study; Non-formal learning; Web tools

1 Introduction

This paper focuses on two pilot studies which were carried out in the Association of Participants Àgora in the framework of the TENCompetence project, a four-year project in the European Commission's 6th Framework Programme, priority IST/Technology Enhanced Learning. The aim of the project was to design a technical and organizational infrastructure for lifelong competence development. The pilot studies were carried out in order to see to what extent people with low educational profiles might benefit from these innovative technologies and be responsible for their own learning. In this context, the TENCompetence infrastructure was employed in order to provide the participants with a set of self-training functionalities to support their competence development process, like goal setting, self-assessment, planning and self-regulated learning.

An important conclusion of the first pilot was that the TENCompetence infrastructure can be successfully applied in the challenging context of Àgora, despite the low educational levels of the participants and the diversity in their profiles, i.e. educational background, professions, computer skills, gender and age. The Personal Development Planner in a Rich client version (see section 2.2.) offered the participants a new way of learning which fostered their self-organization and increased their motivation. Despite the limited time spent on competence development and the technical problems suffered, most of the participants discovered new competence development opportunities, which led them to create several competence development plans associated to various profiles of competences. The participants' reflection and self-confidence was enhanced by the activities during the pilot. In this line, they also realised the existence of a world of further competence development opportunities. More information on the characteristics and results of the first pilot are detailed in the paper 'Self-Development of Competences for Social Inclusion Using the TENCompetence Infrastructure' of the Special Issue of the Journal of Educational Technology & Society (2009, accepted). The second pilot of Àgora was carried out in the same context, though with an enhanced Web PDP and new tools, thus allowing the actors within the TENCompetence project to understand in depth the effects of its outcomes in this challenging context.

The paper is organized as follows. The first section describes the Àgora pilots by presenting the Àgora setting and the TENCompetence tools deployed. The second section focuses on the methodology employed for evaluating the pilot studies. The third section summarizes the results drawn from the study and comparison between both pilots. Finally, the paper presents the conclusions of the pilot studies.

2 Description of the Àgora Pilots

2.1 Àgora setting

Both Àgora pilots took place in the OMNIA computer room (see Figure 1) of the association equipped with 9 computers. The first pilot was carried out during 6 weeks from September 19th to October 30th and the second lasted 10 weeks (including 2 weeks of holidays) from March 9th to June 12th 2009. In both scenarios, the computer room was reserved for using the TENCompetence infrastructure during 14 weekly sessions of 1 hour. Participants also had the possibility of using the TENCompetence tools whenever the OMNIA room was free, including week-ends and after the end of the pilot. In addition, the participants also used the tools at home. The main aim of the pilots was to implement, test and investigate the benefits of the TENCompetence infrastructure and its support for the participants' competence development. The participants were expected to reinforce and improve their competence level in ICT and English language (basic and advanced levels) according to their needs and interest. In addition, a new competence profile was created in the second pilot (Basic Spanish) addressed to immigrant participants. All in all, the learning resources provided in the pilots were mainly related to functional and communicative skills. The learners also had the possibility to develop reflective skills through the use of the different TENCompetence functionalities.

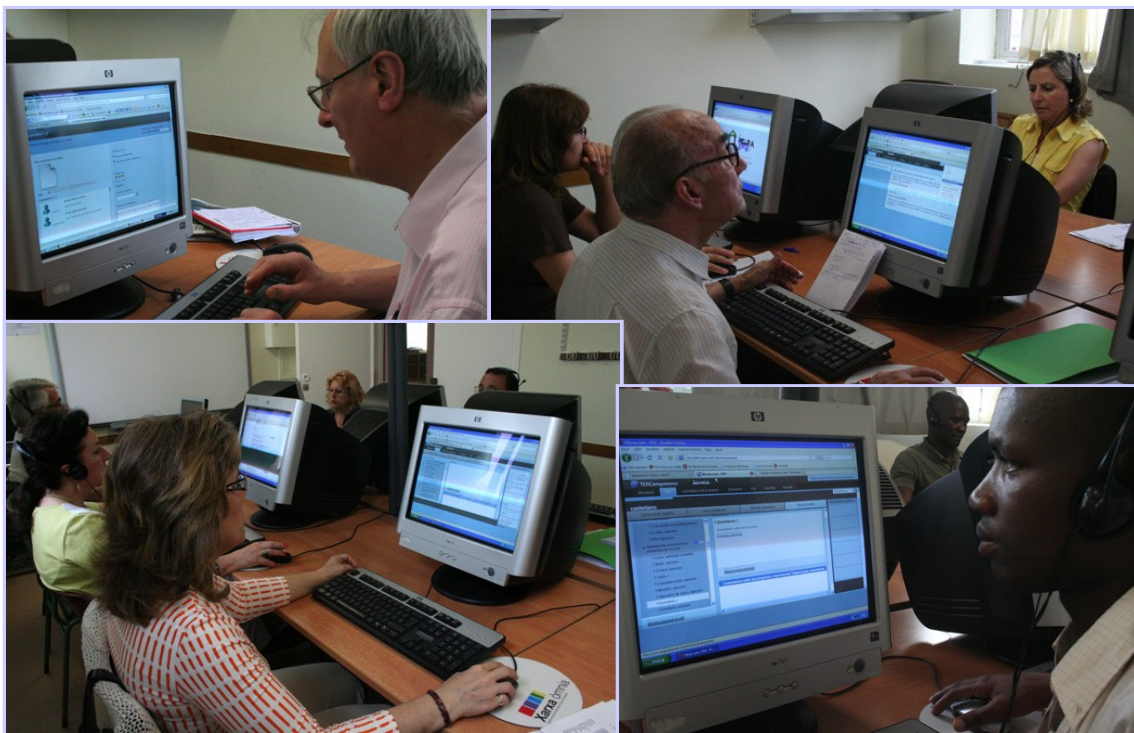


Figure 1: Participants using the TENCompetence tools in the Àgora computer room

Both pilot studies comprised more than 100 learners and 7 experts/observers (Àgora staff), apart from the researchers involved in the investigation. The wide range of adult learners who participated in the pilots varies in terms of origin (second pilot), age, gender, profession, computer skills but also in the variety of needs and interests. Most of them have low academic levels and are characterized by their intrinsic motivation to learn. A TENCompetence expert was in charge of each of the self-training session to assist the users with any technical or content-related issue.

The next section explains and stresses the main differences of the TENCompetence tools employed in both pilot studies.

3 TENCompetence tools used in the pilot studies

In the first pilot, the participants used exclusively a Rich client version of the Personal Development Planner (PDP) whereas in the second pilot the PDP switched to a Web client version and new tools were employed, i.e. Liferay, LearnWeb and the forum.

In both pilot studies, the participants used the PDP as the central tool for planning their learning process and accessing the different activities available in the pilot studies. Figure 2 illustrates the PDP tool (Rich client) used in the first pilot. After creating their own personal plans by selecting a competence profile, the users had the possibility to state their goal and motivation, follow a self-assessment, create their learning plans and eventually perform the activities. In the second pilot, the PDP switched from a Rich client to a Web client. The main functionalities of the tool were improved, i.e. re-organization of the activities and competences, improvement of the self-assessment functionality, additional support provided to help the users in defining their own proficiency level and proficiency level assigned to each activity.

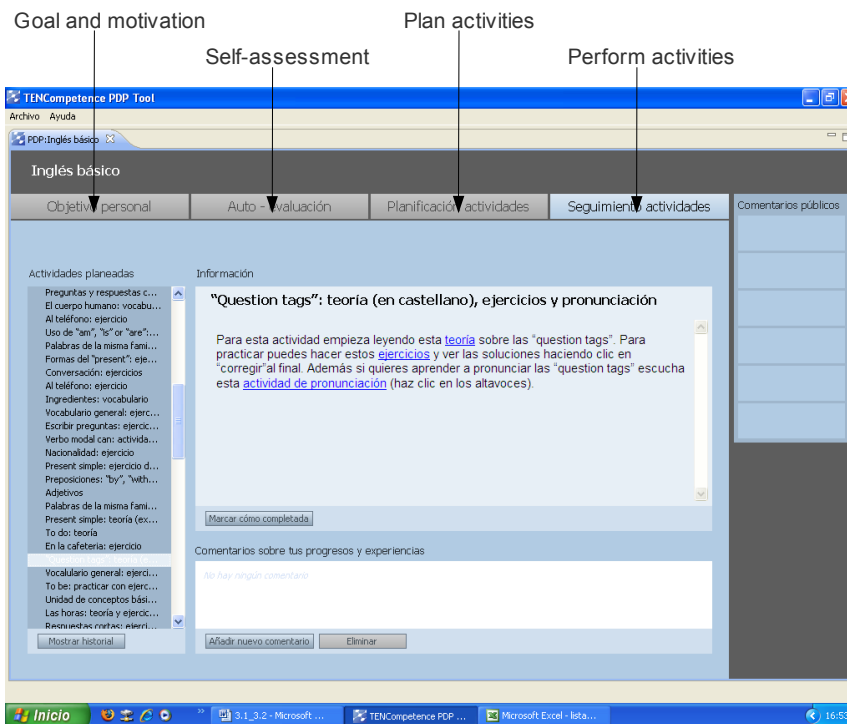


Figure 2: PDP tool (Rich client) including the “Goal and motivation”, “Self-assessment”, “Plan activities” and “Perform” functionalities.

In the second pilot all the TENCompetence tools were integrated as iframes (lightweight front-end integration) in a Liferay portal dedicated to the Àgora pilot. Figure 3 presents the Liferay portal including the TENCompetence tools and functionalities, i.e. the WebPDP; the “Self-assessment activities”, the dictionaries, the forum, LearnWeb, and the user guides, which are further detailed in this section. The figures below are all screen shots of the TENCompetence tools used in the second pilot.



Figure 3: Liferay portal with the integrated tools as iframes

WebPDP:

Figure 4 presents the WebPDP tool as it was employed in the second pilot as a Web client. The WebPDP is integrated as an iframe in the Liferay system together with the other tools used in the second pilot.

All the activities available in the WebPDP were organized in a logical order so as to facilitate the learning process of the participants. In this sense, the activities were listed by competences and subjects and in an alphabetic order. The activity title included the proficiency level assigned (4 sub-levels) and a “J” symbol if the activity was a listening activity.

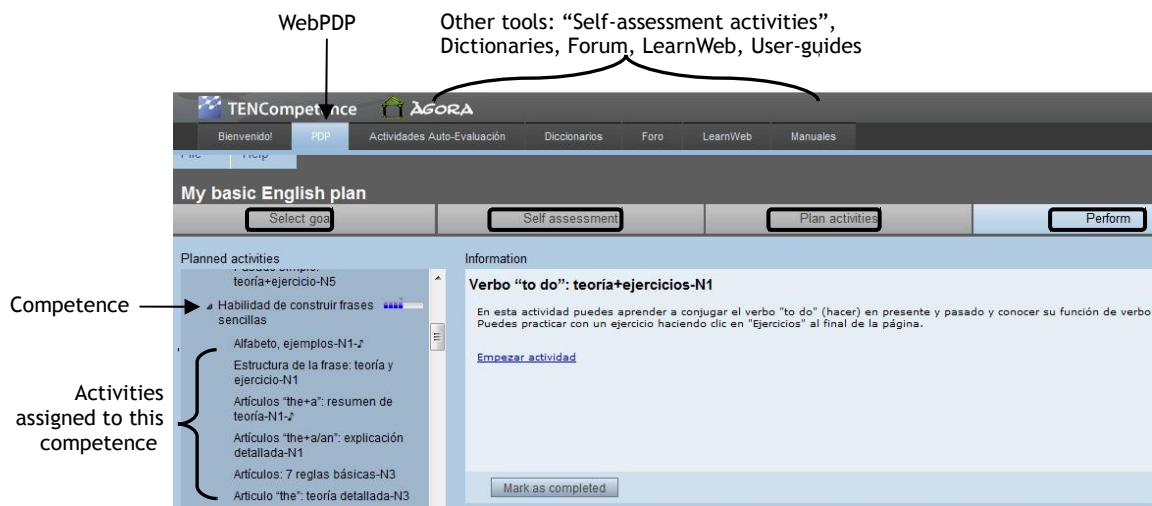


Figure 4: Web PDP tool including the “Select goal”, “Self-assessment”, “Plan activities”

“Self-assessment activities” (Liferay):

Figure 5 shows the “Self-assessment activities” functionality of Liferay. It is based on tests that the participants can take in order to help them determining their own proficiency level for a specific competence.

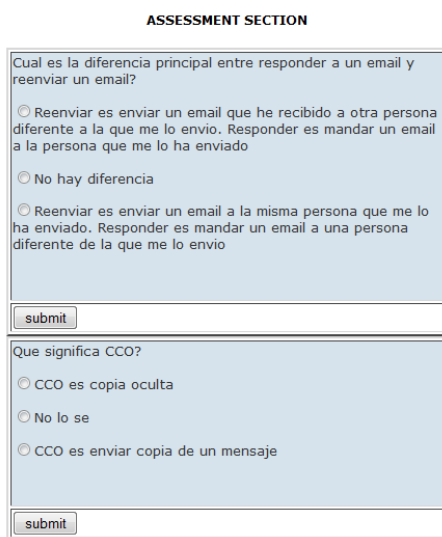


Figure 5: Example of a test executed by QTI runtime

Forum:

The forum was used for different purposes: to share ideas and exchange impressions, to seek information on the PDP and to be updated with regard to the latest news regarding the tools and activities.

LearnWeb:

Figure 6 represents the LearnWeb tool which was used, only in the second pilot, as a container of Web 2.0. tools to manage and share resources (photographs, videos, etc.), make group work, etc.

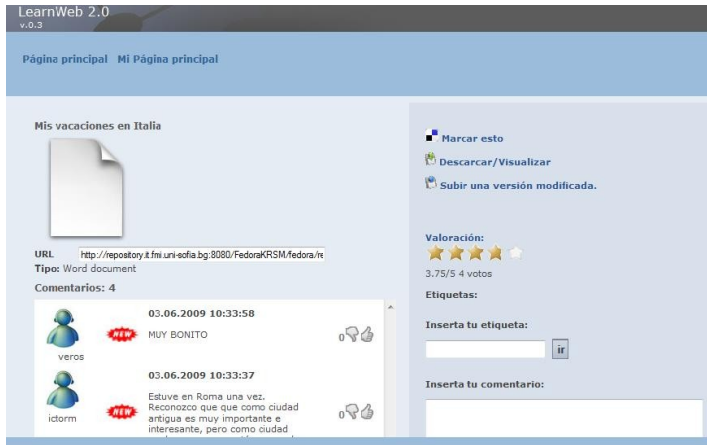


Figure 6: LearnWeb “My home page”

4 Evaluation of the pilot studies

4.1 Evaluation methodology

The main findings and outcomes resulting from both pilot studies are further explained in the next section. In both cases, results were obtained using a mixed evaluation methodology which combines qualitative and quantitative data gathering techniques (Creswell, 2003; Zelkowitz & Wallace, 1998) as listed in table 1.

On one hand qualitative data was gathered. This came from a questionnaire which the participants had to complete at the beginning of the pilot studies (pre-test) to establish their personal profile and expectations, and from a questionnaire at the end of the pilot (post-test) to understand the extent to which the participants appreciated the tools and functionalities employed. In addition, the log files generated by the TENCompetence infrastructure also provided quantitative data for the analysis (Glahn et al., 2008). Google analytics made it possible to measure the number of visits made to Liferay and the integrated tools. On the other hand, qualitative data was gathered in order to deepen the trends resulting from the analysis of the quantitative data. The data sources included observations made by the experts during the self-training sessions in the Àgora computer room. Post-observations (see Table 1) were also collected in order to take into account the informal and hindsight perception of the participants with regard to any issue related to the pilot studies. One focus group with the participant and another one with the experts were conducted before the end of the pilots in order to deepen the data results collected through the observations. Based on these evaluation techniques, the data obtained was triangulated in order to obtain

trustworthy conclusions (Guba, 1981; Creswell, 2003).

Table 1. Data sources for the evaluation of the pilot and labels used in the text to refer to them

Data source	Type of data	Labels
Questionnaires before (pre-test) and after (post-test) the pilot experience	Quantitative and qualitative participant characteristics, expectations and evaluation.	[pre-test] [post-test]
Observations during the pilot	Record of observations (technical issues, about the activities, interactions with experts and other participants, behaviour, other incidents, etc.) The observations were made by 6 different experts in the first pilot and 7 experts in the second (Àgora staff, UPF researchers)	[observerX-date] and [observerX-session], where X represents different observers (from 1 to 7); date is the specific date when the observations were made in the first pilot and session is the specific number of the face-to-face session when the observations were made in the second pilot.
Focus group with participants	Qualitative: participants' opinions before the end of the pilot	[focus-participants]
Focus group with experts	Qualitative: experts' opinions before the end of the pilot	[focus-experts]
Log files	TENCompetence server logs of the PDP tool (taking into account only the participants' logs)	[logs]
Visits to the Web portal and tools	Google Analytics records about the number of visits to the Liferay site and the integrated tools as iframes (including visits of the participants and the supporting staff)	[visits]
Description of the Àgora context	Qualitative descriptions of the context characteristics in which the pilots are framed (see "Description of the Àgora pilots")	[context]
Observations post-pilot	Records of opinions and observations of perceptions in Àgora once the pilots had finished (collected by Àgora staff)	[observations-post]

5 Results and comparison between the two pilot studies

We now summarise the results of the evaluation and the comparison between the two pilot studies carried out in Àgora. This section focuses on one of the main findings resulting from the analysis of the quantitative results and qualitative data collected throughout the pilot periods and beyond: participants appreciated this new way of self-organized learning.

Finding 1: technology supported self-competence development can be useful and beneficial despite the diversity in the participants' background, even when most of them have low educational levels

Results and comparison between the pilot studies: The participants' characteristics are quite similar in both pilots. 38% of the learners in the second pilot also participated in the first. Despite the wide diversity in the participants' profile with regards to age, gender, origin (second pilot), profession, educational levels (the large majority does not have any university degree), computer skills (mainly low), interests and needs and their little experience with regards to competence-based learning:

- most participants completed the pilot in the Àgora computer room or at home (especially in the second pilot as the tools were web-based)
- the technical problems (particularly in the first pilot) and the complexity to use the tools (second pilot) did not hinder the participants' involvement
- they used most of the PDP functionalities in the first pilot and were active users of the TENCompetence tools in the second one (Liferay and integrated tools).

Supporting data: Based on the analysis of the pre-test, post-test, context, observations, visits and log files

Finding 2: Participants appreciated this new way of self-organized learning

Results and comparison between second the pilot studies: The positive results with regards to the appreciation of this new way of learning in the first pilot were enhanced in the second pilot (75% versus 54% enjoyed this new way of learning). Their appreciation of this way of learning is reflected in the intention of the participants to continue developing competences in the future and at an even higher scale in the second pilot (90% versus 83%).

The following facilities of the tools were appreciated in both pilots but especially in the second one:

- being able to work at their own rhythm
- being able to choose the activity in accordance with their own proficiency level (improved in second pilot). They found the activities easier to carry out, and more interesting and useful, as it was simpler for them to identify the competences and associated activities
- having control on their own learning (note that the extended experience of the users who participated in both pilots might enhance the way in which they felt in control of their learning process).

The participants appreciated that the tools switched from a Rich client to a Web client as their wish to work from home could be satisfied. As a consequence:

- they enjoyed the possibility of choosing for themselves when to work on their competence development (flexible timetable, no time restraints, etc)
- they spent more hours on competence development at home (10.9h versus few hours in the first pilot) than in the computer room (6.7h versus 5.3h)
- they learned more with regards to the different competence types, i.e. functional skills, cognitive skills, reflective skills (except social skills)
- they keep on using the tools after the end of the pilot (especially after the second pilot), which is a good indicator of the long term value of the tools beyond the scope of the supported pilots.

Supporting data: Post-test, focus group with participants observations, visits and log

files support these results

Finding 3: The experience fostered the participants' reflection and self-confidence

Results and comparison between the pilot studies: In both pilots, the functionalities of the tools fostered the participants' reflection and self-confidence:

- the self-assessment possibilities ("self-assessment of the PDP, definition of the different levels and "self-assessment activities" (second pilot) helped the participants to reflect on their previous experiences and on new learning possibilities provided in the system. It had an effect on their motivation as they realized what they are able to do;
- they highly appreciated the possibility to see how they advanced in their own learning process (81% in the second pilot versus 86% rate the "Mark as complete" functionality as (very) useful);
- the creation of new activities as the pilot went along (second pilot) at the request of the participants made them reflect on their real needs in terms of learning and created motivation;
- the participants discovered what they could learn and improve in the future, which opened a door to further competence development opportunities. Through the competence profile list of the PDP, they found out that they could develop more competences and also new competences they did not think of before;
- some participants explained how they lost their fear of the computer and new technologies as a results of the pilot experience.

Supporting data: Supported by post-test, observations during the pilot and post-observations, focus groups with participants and experts

Finding 4: The recommendations for the improvement of the TENCompetence tools and functionalities resulting from the first pilot experience were taken into account in the second pilot and were shown to facilitate and optimize the participants' learning process. These included better organization of the competences and activities, more interactive activities, better support in the identification of the proficiency levels.

Results and comparison between the pilot studies: The main technical problems identified in the first pilot were solved and the recommendations taken into account in order to improve the tooling. New problems appeared but more related to the complexity of the structure of the tools and low level of experience of the participants. The principal points are as follows:

- the users found it easier to choose the activities that best suited them and to advance in their learning process, due to the re-organization of the activities in a logical order (by competences and subject) and by assigning a proficiency level (4 sub-levels) to each activity. In this sense, they found it easier to perform the activities and to select the next activity to perform as they could better identify the activities and choose the one that best corresponded to their proficiency level
- the re-organization of the competences and activities also had an effect on the control of their own learning (62% versus 38% in the first pilot) resulting in a less random choice of activities (19% versus 34% in the first pilot)
- there was a higher appreciation of the learning resources, as interactive English activities were in response to requests from the participants themselves, which

had a positive effect on their motivation and autonomy in performing the activities

- the difficulty in carrying out the non-interactive activities (ICT related activities) was confirmed in the second pilot, and was mainly due to the fact that learners had to perform the activities separately, outside the tools
- it was easier for the participants to identify their own proficiency level thanks to the new self-assessment functionalities created (“self-assessment activities” (tests), definition of the levels of proficiency of the PDP “self-assessment” tab)
- further recommendations arising from the second pilot experience would be to simplify the structure of the tools; i.e. less log-in and log-out requirements, less tabs and more visual help to facilitate the identification of the tool functionalities.

Supporting data: Observations during and after the pilots, post-tests and focus group with participants and with experts lead to these results and recommendations

5.1 Further commentary on the findings

The second finding above highlights that most participants appreciated this new way of self-organized learning. The positive results drawn from the first pilot study were enhanced in the second pilot (75% appreciated this way of learning (very) much versus 54%). This positive appreciation is also supported by the intention of the participants to continue developing competences in the future (90% versus 83%) [post-test].

On one hand, quantitative results reveal that the participants appreciated the PDP functionalities and especially in the second pilot in which most technical problems were solved and the tool elements improved. In this sense, the participants found most of the PDP functionalities useful as they were able to work at their own rhythm, to choose the activities according to their proficiency level and to have a control on their learning process: the ‘self-assessment’ functionalities employed in the pilots were highly appreciated, especially in the second pilot in which the ‘self-assessment’ of the PDP was improved (71% found it useful) and further support provided in order to help the users in determining their own proficiency level, i.e. ‘Self-assessment activities’ (70% found it useful) [post-test]. In addition, a large majority found the ‘mark as completed’ functionality (83%) useful in both pilots (83% versus 86% in first pilot) as they could see how they advanced in their learning process [post-test]. Moreover, the activities and competences were re-organized in a logical order (by competences and subjects, in alphabetic order and with a proficiency level assigned to each activity) in order to facilitate the identification of the activities and the whole learning process. This change had positive repercussions on how the participants felt in control of their own learning (62% versus 38% in the first pilot felt in control of their own learning) as they could better identify the learning resources and choose the activities that best suited them.

Qualitative results also stress how participants benefited from the functionalities of the Web PDP:

“You can work at your own rhythm. You can repeat an activity.” [focus-participants]

“I benefit from the program because I can progress on my own and whenever I have time to practice.” [post-test]

“All in all, they like to perform the activity at their own rhythm.” [Observer1-

session 5]

“Several participants comment that they like this way of learning because although they are following a course in advanced English at the school, their think their level is lower and therefore the existence of different levels in the PDP structure allows them to work according to their own needs and refresh basic elements.” [Observer1-session6]

In addition, although the new tools employed in the second pilot (LearnWeb and forum) were used by a limited number of users, the participants think these tools are useful and have potential [post-test].

All in all, the appreciation of the tools is supported by the PDP usage tracked in the log files and the Google analytics records of the visits made to the different tools in the second pilot. There was an average of 80 sessions in the PDP tool per week during the active periods of the pilot [logs] and a total of 2,561 [visits] to the Liferay site in which a total of 19,193 pages were viewed, i.e. 7,410 Liferay views, 4,949 PDP views, 1490 self-assessment tests views, 353 LearnWeb views, 545 dictionaries views, 335 forum views and 233 user-guides views [visits]. It is worth mentioning that the extended experience of the users who participated in both pilots might enhance the way in which they felt in control of their learning process.

On the other hand, the participants appreciated that the tools were web-based (second pilot) as their wishes to work from home and to be more autonomous in their learning process could be satisfied [observation-all]. They particularly appreciated the possibility to choose themselves when to work on their competences development and not be constrained by attending a course with fixed timetable:

“I think this course is interesting because you can use the program whenever you want and because there is no obligation to attend the self-training sessions in the school as you can do it at home at any time.” [post-test]

The experts confirm this tendency:

“Some of self-training sessions had little assistance as for instance the time-slot from 3pm to 4pm. Participants explained that it was not a convenient time for them. For this reason, some of them preferred continue working from home.” [observer6-session3]

“The time to practice in the computer room was insufficient. One hour is too short. For those who have Internet at home, no problem.” [focus-experts]

It was also observed that learning supported by Web tools also enable people to better combine family life and the will to learn:

“A participant commented that this way of learning is very convenient as she hasn't got much time because of her 3 children. Therefore, this way of learning helps her to combine her family life with the possibility to learn.” [Observer1-session10]

As a consequence, the participants spent more hours on their competence development at home (10.9 hours versus few hours in the first pilot) and learned more with regards to the different competence types, i.e. functional skills, cognitive skills, reflective skills (except social skills) [post-test].

Last but not least, the participants used the tools during the Easter holidays, at weekends and after the end of the pilot (especially after the second pilot), which is a

good indicator of the long term value of the tools beyond the scope of the supported pilots [visits] [logs].

6 Conclusion

This paper has presented the main results emerging from the evaluation of two pilot studies which investigated the benefits of the TENCompetence infrastructure in its support for self-competence development in the challenging context of Àgora where most participants have low educational profiles. More than 100 people participated in each pilot and used the PDP (Rich client in the first pilot and Web client in the second pilot) as a central tool for planning their learning process and develop competences. In the second pilot, the participants had the opportunity to use new tools, i.e. Liferay, LearnWeb and the forum. All in all, the positive results of the first pilot were enhanced in the second pilot due to the improvement of the tools and functionalities.

The main conclusions drawn from the two pilot studies provide evidence that the TENCompetence infrastructure can be beneficial and useful for the self-competence development of learners with low educational levels. Although the participants had a low level of computer skills and were not familiar with self-training, they enjoyed this way of learning and expressed their wish to continue developing competences in future. The participants particularly appreciated the possibility, through the use of the main functionalities of the WebPDP, of working at their own rhythm, to choose the activity in accordance to their own proficiency level and to have control of their own learning. As a consequence, the participants have learned much with regard to reflective skills and especially regarding finding out what things they could learn/improve in the future.

The main requirements for the improvement of the TENCompetence tools and functionalities resulting from the first pilot experience (self-assessment support, further functionalities for communication and sharing, and better organization of the competences and activities within the PDP) were taken into account for the development of the second pilot and have been shown to facilitate and optimize the learning process of the participants. Further recommendations emerging from the second pilot are based on the need to simplify the general structure of the tools (less log-in and log-out requirements, less tabs, and more visual help to facilitate the identification of the tool functionalities). Last but not least, the participants used the tools during the Easter holidays, at week-ends and after the end of the pilot, which is a good indicator of the long term value of the tools beyond the scope of the supported pilots.

Acknowledgements

This work has been partially funded by the European Commission in the TENCompetence project (IST-2004-02787). The authors especially thank the Association of Participants Àgora, staff and collaborators for their encouragement and dedication to both pilots. The authors would also like to acknowledge the contributions from other members of the GTI Group at UPF, the OUNL (Christian Glahn), and other TENCompetence partners' members.

References

Creswell, J. W. (2003). Research design: qualitative, quantitative, and mixed method

approaches (2 ed.) London, UK: Thousand Oaks, Sage Publications.

Glahn, C., Specht, M., Schoonenboom, J., Sligte, H., Moghnieh, A., Hernández-Leo, D. Stefanov, K., Lemmers, R., & Koper, R. (2008). Cross-system log file analysis for hypothesis testing. Proceedings of the 4th TENCompetence Open Workshop “Empowering Learners for Lifelong Competence Development: pedagogical, organisational and technological issues”. Madrid, Spain, 10-14.

Guba, E.G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology: A Journal of Theory, Research, and Development*, 29 (2), 75-91.

Louys, A., Hernández-Leo, D., Schoonenboom, J., Lemmers, R., & Pérez-Sanagustín, M. (2009). Self-Development of Competences for Social Inclusion Using the TENCompetence Infrastructure. *Educational Technology & Society*, 12 (3) (accepted).

Zelkowitz, M. V., & Wallace, D.R. (1998). Experimental models for validating technology, *IEEE Computer*, 31 (5), 23-31.

TENCompetence tools and I*Teach methodology in action: development of an active web-based teachers' community

Nikolina Nikolova¹, Krassen Stefanov¹, Cornelia Todorova¹, Eliza Stefanova¹, Miroslava Ilieva², Henk Sligte³ and Davinia Hernández-Leo⁴

1. University of Sofia "St. Kl. Ohridski", 5 James Boucher Blvd. 1164 Sofia
2. National High School of Mathematics and Sciences, 52 Bigla Str., 1164 Sofia
3. University of Amsterdam, SCO-Kohnstamm Institute, Postbus 94208, 1090 GE Amsterdam
4. ICT Department, Universitat Pompeu Fabra, Roc Boronat 138, 08018 Barcelona, Spain

E-mail: nnikolova@fmi.uni-sofia.bg

Abstract: The article presents an example of how Information and Communication Technologies (ICT) can enhance the process of teacher training, and how this can be used for lifelong competence development for teachers. The paper describes the goals, settings, implementation and results of a pilot teachers' training realized within the frame of the European project TENCompetence. ICT tools developed in TENCompetence project were used to support the introduction to the I*Teach didactical methodology developed in the frame of I*Teach Leonardo project. It became clear that the ICT tools and didactical methodology offer a strong support for teachers' professional development.

Keywords: lifelong learning, teachers' training, active learning methods, competence development

"Education is not a preparation for life; it is life itself." - John Dewey

1 Introduction

In the recent years the Bulgarian Ministry of Education and Science (MES) has developed and initiated a global strategy for the implementation and introduction of information and communication technologies (ICTs) in educational processes. Appropriate use of ICTs in education motivates students by providing more attractive and effective ways of study supported by multimedia demonstrations and visualizations of learning content, interactive applications for self-exploration, and knowledge about recent achievements in particular subject areas.

In order to realize this strategy, teachers should first be ready to use ICTs in their lessons, as well as to sustain and deploy their professional competences. They need to be familiarized with different ICTs, to have tools for lifelong self development, and to master didactical methodologies for applying ICTs in education.

Working in close collaboration with MES, we organized a series of pilot teacher training activities, in which we combined the products of two European projects - TENCompetence, providing technical and organisational infrastructure, and I*Teach, offering a new didactical methodology for teaching *soft skills* (Stefanova, Sendova, v.

Diepen, Forcheri, Dodero, Miranowicz and Brut, 2007). This article presents the third teacher training pilot, which used an enhanced version of the TENCompetence infrastructure, improved as a result of analysis of the first and second pilot training courses (Schoonenboom, Sligte, Hernández-Leo, Moghnieh, Stefanov, Glahn, Specht, and Lemmers, 2008; Stefanov, Nikolova, Ilieva and Stefanova, 2008).

Each of the pilots used the TENCompetence Personal Competence Manager (PCM) available at the time of the pilot (2007, 2008 and 2009). During the third pilot, the infrastructure included not only functionalities related to the creation and performance of the Personal Development Plan (PDP), but also a means for searching and sharing resources (LearnWeb2.0), and providing guidance to users in defining their learning goals (GOT).

2 TENCompetence project

The TENCompetence project was a four-year project in the European Commission's 6th Framework programme, within the priority IST/Technology Enhanced Learning. The aim of the project was to design a technical and organisational infrastructure for lifelong competence development. The project developed new innovative pedagogical approaches, assessment and organisational models, and created a technical and organisational infrastructure, which integrated existing isolated models and tools for competence development into a common framework (TENCompetence Foundation, 2009).

The infrastructure uses open-source, standards-based, sustainable and innovative software technology. With this freely available software infrastructure, the European Union aims to boost the European ambitions towards Knowledge Society by providing to all European citizens and other organisations an easy access to facilities that enable lifelong development of competences and expertise in the various occupations and fields of knowledge. The purpose of the development of the TENCompetence Integrated System has been to provide a software framework for the effective and efficient support of users who create, store, use and exchange knowledge resources, learning activities, units of learning, competence development programmes, and networks for lifelong competence development. The main TENCompetence components are Network of Learning, Competence Development programmes, Unit of Learning, and Knowledge Resources (Stefanov, Naskinova and Nikolov, 2007).

3 I*Teach

The *Innovative Teacher (I*Teach)* (Innovative teacher: I*Teach Leonardo project, 2006) project was a pilot project launched in October 2005 under the Leonardo da Vinci programme. It was oriented towards the European Council Lisbon meeting (2000) guidelines for lifelong learning and using ICTs in education.

The first goal of the project was identifying the most important skills which one has to possess to receive better realization in the information society. These skills are also called *soft skills* (related to motivation, integration, communication, sociability), in contrast to the *hard skills* (related to the ability to perform well in a specific context or job). After profound/exhaustive exploration, four groups of *soft* (non-technical) skills were identified:

Working-on-a-project skills - rationalization of the main task, creating a work plan, defining subtasks and sub-products, integrating results, keeping track of the progress,

analysing the whole process etc.

Information skills - ability to determine the information problem, collect and process appropriate information, to evaluate information, to extract the most important information, to use appropriate technical tools for searching and systematisation of information.

Working-in-a-team skills - skills of internal and external communication, ability to give/receive feedback, to support the other members of the team, to define and keep own role, to take responsibility.

Presentation skills - ability to choose the appropriate presentation media and appropriate design, to command language and behaviour, to make correct citations etc.

The next outcome of the I*Teach project, presented by Stefanova et al. (2007) was a methodological framework defining a way of teaching these skills. The framework is based on active methods of learning, especially on project-based learning. Its main characteristics are initial *challenge*, final *product*, and intermediate *milestones*. The challenge should be attractive and motivating for the learners. The final and intermediate products are required to correspond to the particular discipline. The learners are free to choose their own way through the milestones to the final product improving their soft skills by the aid of the teacher.

4 Hypothesis

We aimed to prove the significance, usability and effectiveness of TENCompetence software platform and methodology used for complex competence development programmes in authentic learning settings. At this stage, there is no appropriate software platform and tools aiming to fully support the I*Teach Methodology, so we expected that the use of the TENCompetence platform would significantly improve the way teachers adopt the I*Teach methodology.

During the pilot we tried to answer the following questions:

- Do the TENCompetence tools provide flexibility of the time management and organisation for self-education?
- Do the TENCompetence tools provide means of control the self-education?
- Do they help teachers to easily orient where to find relevant high quality learning materials?
- Do they provide an appropriate environment for study how to apply I*Teach methodology?
- Do they ensure means of experience exchange and collaborative work?

5 Methodology

The pilot used the following types of learning:

- project-based learning
- problem-based learning
- active learning
- self-organized learning
- communities of practice
- knowledge management

The main competences involved are the so-called enhanced competences and skills, which are an extension of the *soft skills* by the usage of ICT.

The four main competences corresponding to the I*Teach methodology were included in this pilot:

- How to teach information skills using ICT
- How to teach presentation skills using ICT
- How to teach working on a project skills using ICT
- How to teach working in a team skills using ICT
- Each one is further sub-divided in other sub-competences.

For each main competence we have developed a competence profile, and for each competence profile - several competence development programmes.

The training was conducted in two phases: short two days face-to-face stage of tutored learning followed by two weeks distance education. Learners were asked to fill in pre- and post-test questionnaires.

6 The (Lifelong) Learners

A total of 30 teachers of different subject areas, 28 women and 2 men, started the competence development in the ICT pilot. Their mean age is 44,1 years with a standard deviation of 6,4 years; all participants are between 30 and 57 years old. The median lies at 44 years old. All participants live in Bulgaria.

Twenty-four of the 30 participants hold a University Master's degree, 5 - a Bachelor's degree, and one participant holds a PhD. All 30 gave their profession as teacher, and 29 gave the same for their current job function. One was a deputy headmaster.

The results of the pre-test showed that most of the respondents (approximately 83%) considered themselves beginners or intermediate with respect to the ICT enhanced competences described above.

Although most of the participants (86,6%) often use a computer in their daily life, nearly 50% had little or non e experience with using a virtual campus. In addition, 10% of the trainees indicated to have never participated in a competence-based training.

As for the preferred style of learning, 46% of the group liked structured education with an outlined path to be followed, while 20% would like to see outlined path but also to have a choice of their own path. As 30% did not share an opinion, we tried to prepare a learning environment that could satisfy both styles of learning.

7 Learning resources and tools

We used Moodle as the Course management system. The educational scenario was described and further elaborated on by presentations, handbooks, and assignments. The learning materials were published in Moodle: electronic versions (*ppt* and *doc* format) of the printed handbooks in the Bulgarian language, Moodle's web 2.0 glossary, assignments for the face-to-face sessions, and a final project assignment. A discussion forum was also included.

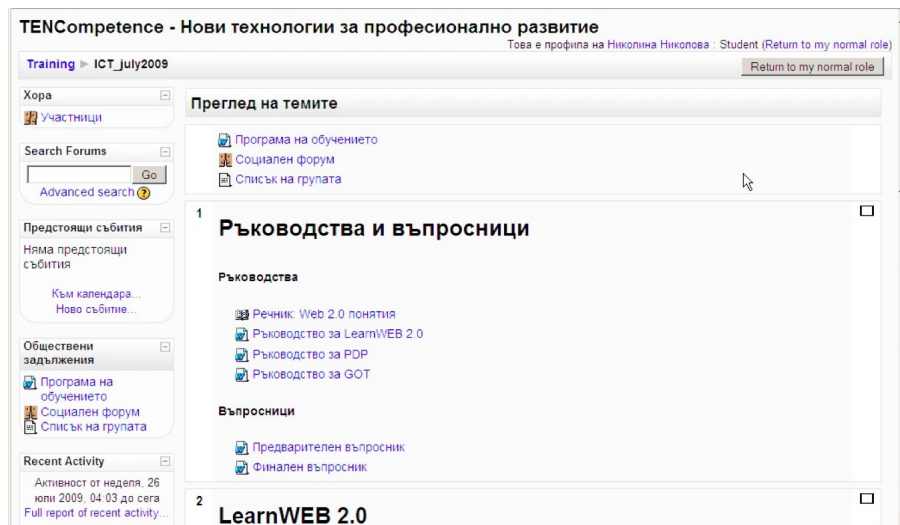


Figure 1: Moodle e-learning environment

The following TENCompetence tools were available to be used and mastered during the pilot:

Personal Competence Manager (PCM): This tool was used by the trainers to create relevant Competence Profiles and Competences.

LearnWeb2.0: the tool was used to search for relevant multimedia resources, for evaluation and comments about resources, as well as for publishing own materials. Its use was essential for all the tasks and studying projects.

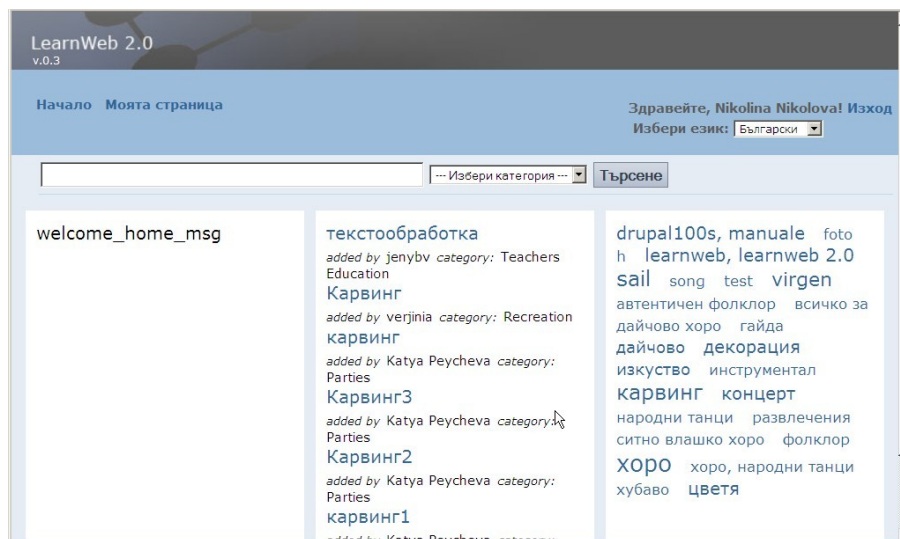


Figure 2: LearnWeb: Resources added by teachers

Personal Development Plan (Web PDP): This was the basic tool for presenting the approach of the I*Teach methodology. The trainees used a preliminary created profile and basic plan to evaluate their own competences, adapt the plan, add useful resources and implement the plan. The associated blog was used for sharing experiences.

TENCompetence tools and I*Teach methodology in action: development of an active web-based teachers' community

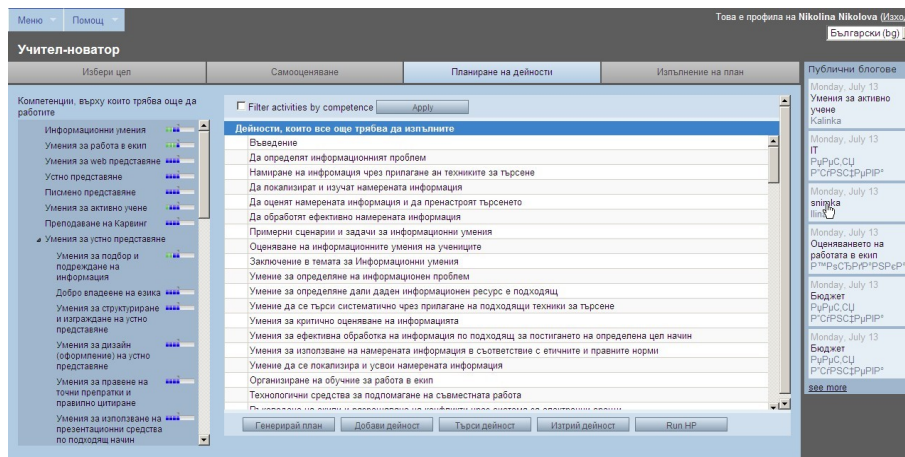


Figure 3: Web PDP: I*Teach Methodology personal development plan

Goal Orientation Tool (GOT): This was the favourite tool of the participants. They used it to find relevant communities and profiles, to get into contact with peers, and to see how people with similar professional interests develop their competences.

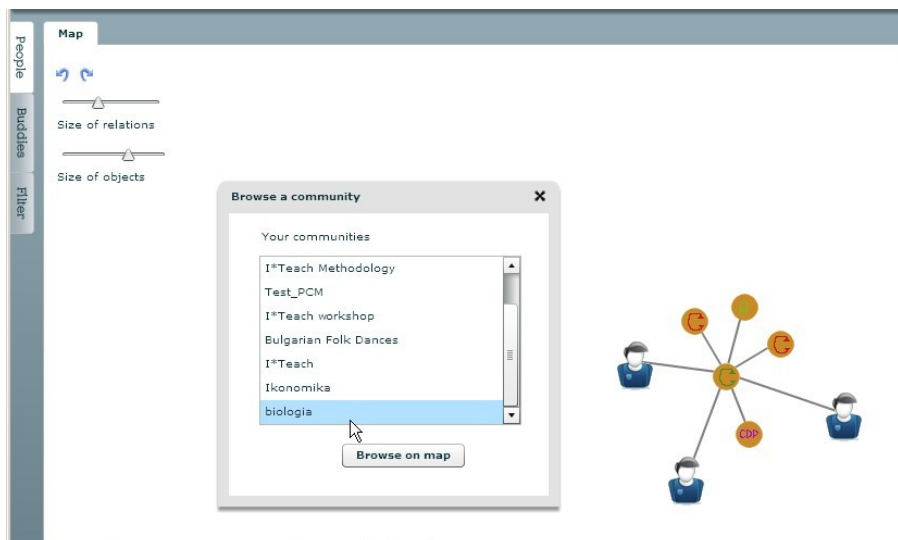


Figure 4: GOT: Joining professional community

All these tools were used together in the context of the tasks given. For the introduction of/work on the assignments were used the PDP, LearnWeb and Goal Orientation tool, as well as web 2.0 applications - YouTube, Flickr, ipernity, Delicious, TENTube etc.

The participants adapted the basic personal development plan for studying I*Teach methodology according to their knowledge and needs. They used the integrated blog to share useful learning resources found on the Web 2.0 applications by LearnWeb. They added comments, ratings and votes for others' comments to the found resources. Teachers found other people with the same or similar goals through the GOT tool, and used their experience for planning their self-training.

During the distance learning phase, the participants published their authored photos and videos in YouTube and Flickr, and described them in the LearnWeb tool.

8 Educational Scenario

The educational scenario was based on a *learning-by-doing* approach. It was implemented in two stages - a short (2 days) face-to-face stage and a longer (2 weeks) distance learning phase.

Face-to-face stage:

The face-to-face stage started with a presentation of participants - their names, subject area in which they teach, personal interests. The aim of the presentation was not only to *break the ice* but also to work more effectively by grouping together participants with common interests.

After the trainees' presentations, they were divided in two groups of 15 or 16 participants each. Each group was facilitated by two trainers.

First of all the trainees were familiarized with Web 2.0 terminology and concepts (blog, tag, folksonomy, etc).

The next step was to introduce the trainees to how to use the LearnWeb tool to search, evaluate, comment, and classify learning resources. The training was based on an assignment about improving folk dance skills. The topic was chosen on the basis of preliminary done inquiry about teachers' interests.

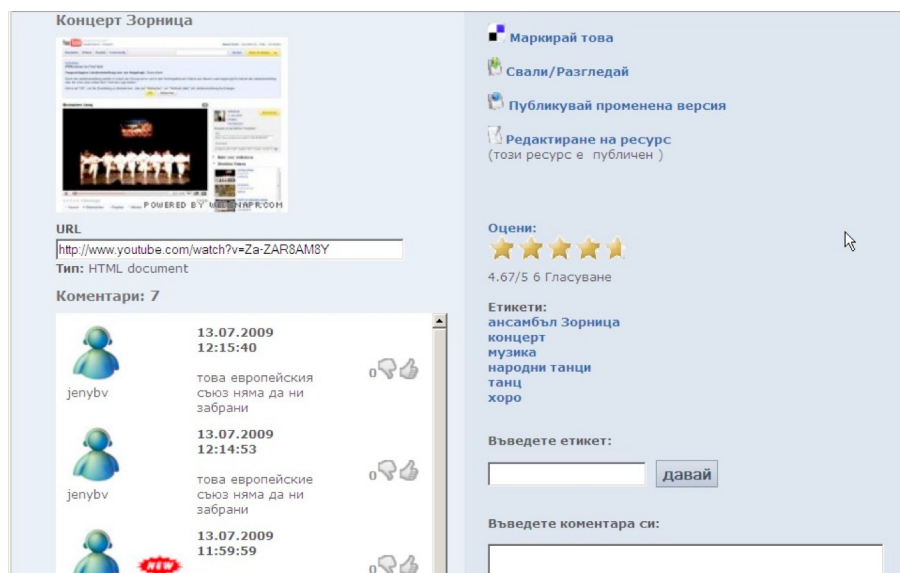


Figure 5: LearnWeb: Tagging and commenting a Folk Dances video lesson

Familiarization with the PDP tool was achieved through an assignment, in which the I*Teach methodology and active methods of learning/teaching were studied. The task given to the participants was to evaluate their own skills, to adapt the basic development plan with which they had been provided according to their needs and style of learning, and to implement the plan using the blog in which their progress and experience were shared. The link to LearnWeb was used for searching for useful learning resources.

Another task was to find *buddies* (using the Goal Orientation tool) who also had an interest in the I*Teach methodology and to share the completed plans with them. Some teachers browsed the buddies' profiles using the TENTube tool.

The last assignment during the face-to-face stage was devoted to the art of carving. The teachers could study what carving is, its history, what tools are used in this art, and find pictures of international exhibitions. After that, they had to create a development plan and find learning resources for studying the art of carving. The implementation of the plans was left for the distance learning phase.

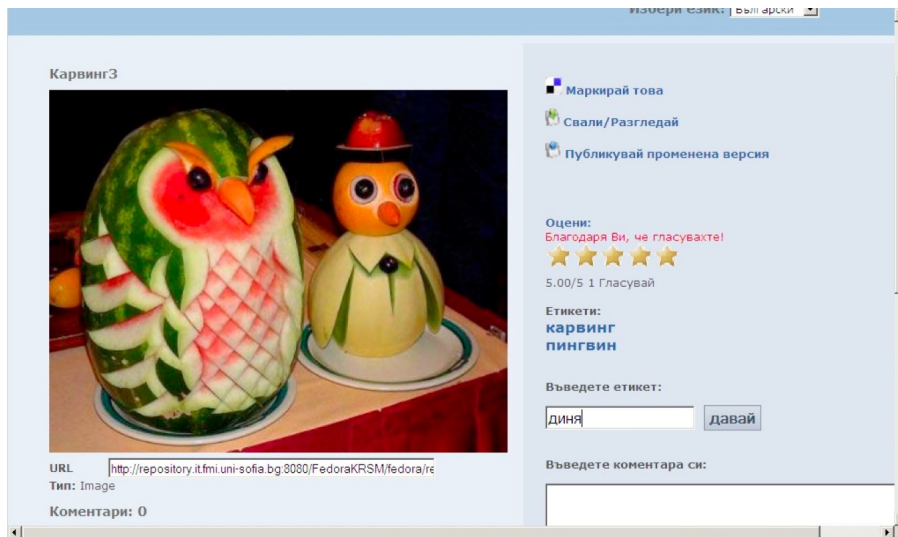


Figure 6: LearnWeb: The art of carving

Distance learning stage:

During the two weeks distance learning stage teachers had to complete the studying of carving art and to share pictures of their products and videos showing their progress.

Their final assignment was to create and implement their personal development plan related to the improvement of their professional skills in their teaching area. The plan had to be supported by relevant learning resources found on the web. Teachers were encouraged to share their experience and to collaborate with other teachers.

During the final meeting teachers showed their results and commented on their progress, problems, and ways of solving.

9 Evaluation methodology

Quantitative data were collected by two questionnaires:

- a pre-test at the beginning of the pilot devoted to the participants' characteristics and expectations of the pilot;
- a summative evaluation of the pilot, which was completed by the participants in the last week of the experience. The questionnaire addressed the usefulness of the given tools and the level of satisfaction of the trainees.

The pre-test contained 27 short questions. In addition to the personal characteristics (age, profession, educational degree, etc.) and their previous experience in web-based learning, we asked them to describe their willingness to acquire the following basic types of competences:

- Knowledge
- Functional skills- know how to do things

- Social skills
- Know- how to behave according to the rules and values of the profession
- Know- how to guide their future use by reflection on current practice
- Know- how to find creative solutions for problems related to this competence

We investigated their motivation for participating in the pilot (to keep up-to-date, to improve their current job level, to define new learning goals, to receive help on a non-trivial learning problem, or to explore the possibilities of a new field)

The summative evaluation questionnaire contained 64 questions addressing the users' opinion about the main functionalities of the presented TENCompetence tools, PCM, GOT, LearnWeb2.0 and Web PDP, in relation to competence-based learning such as self-assessment, adding, sharing, rating and commenting resources, voting, participating in blogs, activity planning and doing, etc.

The participants had to describe their overall impression of the difficulty and usability of the learning resources; they had to assess the level of user control over the learning process and the level of collaboration during the pilot. They were also asked whether they had encountered technical problems, whether they have liked competence-based learning, and whether they would continue to further develop these competences.

The participants also had to explain whether they have experienced any benefits from the training, in which areas and what types of competences they acquired (knowledge, functional, social skills, etc.)

Qualitative data were collected by a real time observation.

10 Results

The observation showed that all the trainees participated actively in all activities during the pilot.



Figure 5: Discussion about the relationship of the TENCompetence tools

The summative evaluation questionnaire showed that the participants spent 16 hours

on average on the self-training sessions in the computer room (SD=1,74 hours; Minimum=13 hours; Maximum =21 hours). The participants reported an average of 2,6 hours, with a minimum of 1 hour and a maximum of 6 hours spent at home or elsewhere.

The average appreciation was “they enjoyed this way of learning, with 84% . The rest were neutral, but none was negative. The large majority (87%) wanted to (definitely) further continue developing this competence(s) in the future, one person was not sure, and only two people (6%) did not want to.

Although the participants showed a high level of satisfaction on the whole, 7 people said that their learning process was completely hindered by the technology. These technical problems could be explained by the context of the pilot. The participants had had some experience using computers; however they were not highly competent in using of ICT and, in particular, in using the learning systems. In addition some teachers believed that perfect ICT skills were the foundation of perfect teaching and pedagogical realisation. These teachers were almost entirely *blocked* by the feeling that they were not ICT experts (Stefanova, Nikolova, Kovatcheva, Boytchev & Sendova, 2009).

With regard to the experienced benefits from participation in comparison to the situation at the beginning of the pilot, it seemed that there were two groups: a group of 10 people who said that they experienced few benefits, and a group of 19 people who experienced many. Nine people of the first group indicated that they had large or total technical hindrances. Of the group with many benefits, only two reported many technical problems.

When participants were asked in what areas they experienced benefits, most of them noted down improvement of their ICT, social and life skills, some of them marked their teaching areas, there were many answers related to the mastering of new didactical approaches, and several people indicated planning and organizing of own learning.

As for the learning resources, almost everyone found the resources interesting (90,3%) or very interesting (3,2%). Two participants were neutral. 90,3% said that the resources were (very) useful, the other 9,7% were neutral. The question whether the resources matched the learning needs was answered by 19,4% hardly, 6,5% moderately, 71% largely and 3,2% completely.

The evaluation of the tools showed that most of the trainees (excluding the people having had difficulty in the use of ICT in general) were very excited by the given tools, and stated that they continue to use them in their further professional development.

Finally, teachers shared some overall impressions of the pilot:

“This training was useful for getting to know new technologies and meeting colleagues with similar interests.”

“New technologies, contacts with colleagues”

“I like this course!”

“Short but useful

“The education was very interesting, interactive and stimulating creativeness. It will be better if there are PCs appropriate to the software needs”

“Useful for our further work”

“Search for colleagues”

“Suggestion for removing some bugs”

“The training was very valuable because it gave us contacts with colleagues with similar interests. I learn how to find quickly useful information and how to share my knowledge, skills and competences.”

Three people said:

“Think well about the competences!”.

Asking them what they mean, they shared that first of all they need to be trained in using a computer, and only after that - in social and pedagogical competences of using ICTs. Although there were large-scale ICT courses for teachers in Bulgaria, there still exists a need of improvement of computer skills for some of them.

11 Conclusions and comparison with previous ICT Teacher Training pilots

The characteristics of the participants were similar in all three ICT Teacher Training pilots, in which the TENCompetence tools were used. The participants were highly educated middle-aged teachers interested in ICT, but not ICT experts. Their main motivation was job improvement and improvement of their proficiency level. 44 professional teachers were involved in Cycle 1 pilot, 136 in Cycle 2 pilot, and 32 in Cycle 3 pilot. There were only a few participants present in more than one pilot. The participants in the three pilots did not differ much in the hours spent on competence development, being between 36 and 60 in the first pilot, between 40 and 60 in the second pilot, and between 15 and 23 in the third pilot. In the third pilot, presented in this paper, participants did not only devote time to competence development in the computer room where the PCM was available, but also at home (on average of 2,6 hours). This could be as a result of the Web aspect of the enhanced system but it also denotes the interest of the participants.

The analysis shows that Cycle 3 ICT teacher training pilot exceeds the results of previous pilots. A large majority (84%) of the participants enjoyed this way of learning (very much) and (87%) wanted to (definitely) further continue developing this competence(s) in the future. They experienced benefits in different areas such as ICT, Mathematics, social skills, creating a self-development plan, self-assessment, implementation of new methods for self-improvement, working with tags, and working in web communities.

Some participants, especially those not reporting general technical problems, pointed out concrete benefits of their participation in the pilot in comparison to the situation at the beginning of the pilot. 73% of the participants let the system generate a plan based upon their self-assessment. 50% of the participants did not follow the activities as listed in the resulting outlined plan. This was by 30% more of the participants who had said that they prefer having the resources with an outline path but with the possibility of choosing their own path at the beginning of the pilot (only 20% said in the pre-test that this would be most supportive for their learning).

More than 83% of the participants found that LearnWeb2.0 was (very) useful to search new resources, and more than 93% said that it was (very) useful to share and rate resources. 70% explicitly stated that they used LearnWeb2.0 to find additional resources for working on their competences. Regarding the GOT, more than 77% of participants found it (very) useful to define goals, and more than 90% said it was (very)

useful to search for communities, competence profiles, competences, and resources. 60% of the participants explicitly indicated that they used GOT to find additional resources for improving/developing their competences. Therefore, LearnWeb2.0 and the GOT seemed to be significantly useful to assist competence development in this pilot.

In conclusion we can say that most of the teachers were satisfied with the TENCompetence infrastructure. We believe that these participants will continue using it for keeping the professional contacts built during the pilot, and that they will collaborate in lifelong self-development as teachers. Our expectations are that in combination with the I*Teach didactical methodology, TENCompetence could represent a useful approach for implementation of the MES strategy for involvement ICTs in education.

Acknowledgement

This work is supported by the European Commission under the TENCompetence project [project No: IST-2004-02787].

References

- Innovative teacher: I*Teach Leonardo project (2006), Retrieved from <http://i-teach.fmi.uni-sofia.bg/>
- Lisbon European Council 23 and 24 March 2000, Presidency Conclusions, Retrieved from http://www.europarl.europa.eu/summits/lis1_en.htm
- Schoonenboom J., Sligte H., Hernández-Leo D., Moghnieh A., Stefanov K., Glahn C., Specht M. & Lemmers R. (2008). Supporting life-long competence development using the TENCompetence infrastructure: a first experiment, *International Journal Emerging Technologies in Learning*, 51 (3), pp. 53 - 59.
- Stefanov, K., Naskinova, I. & Nikolov, R. (2007). *ICT-enhanced Teacher training for Lifelong Competence Development*. Abstracts and Proceedings of the Joint IFIP Conference: WG3.1 Secondary Education, WG3.5 Primary Education: Informatics, Mathematics, and ICT: a 'golden triangle' IMICT 2007 , Boston, MA: CCIS, Northeastern University.
- Stefanov, K., Nikolova, N., Ilieva, M. & Stefanova, E. (2008). Turning University Professors into Competent Learners. *International Journal Emerging Technologies in Learning*, 51 (3), pp. 46 - 52.
- Stefanova, E., Nikolova, N., Kovatcheva, E., Boytchev, P. & Sendova, E. (2009). *Myths and Realities about Technology Enhanced Learning*, In proceeding of International Conference on Software, services & semantic technologies (pp. 116 - 123).
- Stefanova E., Sendova E., v. Diepen N., Forcheri P., Dodero G., Miranowicz M. & Brut M. (2007). *Innovative Teacher: Methodological Handbook on ICT-enhanced skills*, Sofia: Faleza-Office 2000.
- TENCompetence Foundation, Retrieved November 4, 2009, from <http://www.tencompetence.org>

Complementing the Human Resource Management infrastructure of the Doblevia cooperative using TENCompetence

Patricia Santos¹, Miguel-Angel Carralero², Davinia Hernández-Leo¹ and Josep Blat¹

1. Department of ICT Information and Communication Technologies at Universitat Pompeu Fabra, C/Roc Boronat 138, 08018 Barcelona, Spain
2. Human Resources Department of Doblevia SCCL, Plaça Aiguallonga S/N, 08198 Sant Cugat del Vallès

E-mail: davinia.hernandez@upf.edu

Abstract: The Catalan cooperative Doblevia aims at improving their human resource management infrastructure by incorporating functionalities to support the lifelong competence development of their employees / cooperative members. The TENCompetence system appears to be a good candidate to meet their requirements. This paper describes how Doblevia has carried out a plan to introduce this system into their organization. It also explains the main findings obtained from a preliminary evaluation. The findings are analysed to understand the impact and benefits this change can have in an SME cooperative like Doblevia.

Keywords: competences, cooperative, TENCompetence

1 Introduction

A current social challenge in maintaining employment is to provide lifelong learning opportunities which enable professionals to be more competent and efficient. In this context a Catalan cooperative called Doblevia is interested in offering a more flexible human resource management infrastructure to facilitate their staff's competence development. A competence is the *"combination of knowledge, skills and attitudes appropriate to the context. Key competences are those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment"* (European Commission, 2008). A competence-based organization first needs a platform to support lifelong learning, and second requires mechanisms to verify if their employees have acquired the necessary competences (for example to qualify them for promotion).

The TENCompetence project aimed to build a European network for lifelong competence development (TENCompetence, 2009b), and an eLearning environment was developed with to support individual learners, teams and organizations in their pursuit of competence development and competence practice. This was a four-year project in the European Commission's 6th Framework Programme, in the priority area of IST/Technology Enhanced Learning. The project evaluated its tools in various educational scenarios using pilots as a method of evaluation (Louys et al. 2009; Santos et al. 2009; Moghnieh et al. 2008; Stefanov et al. 2007). The conclusions extracted from these pilots have been used to improve the TENCompetence tools and make possible the dissemination of this environment to organizations and individual professionals. In the last year of the project a set of organizations have been selected to evaluate if the integration of the TENCompetence tools is feasible within their own

settings.

One of these organizations is Doblevia. The application of the TENCompetence solutions in Doblevia represents an importance change in the organization, which did not have any competence development policy for its employees.

The benefits of this demonstrator are mainly internal to the Doblevia organization:

- Provision of a tool that facilitates the work of the human resource manager
- Personnel mastering several competence profiles (so as to enhance the flexibility of the organization)
- Lifelong learning opportunities for its employees (keep up to date)
- Knowledge sharing among employees

In this paper we focus our attention on how the TENCompetence environment can be established in a cooperative organization in order to support their human resource management infrastructure. Section 2 describes the context of Doblevia, the objectives that they have in using TENCompetence, and the changes to be implemented in the organization. We detail the integration of the TENCompetence environment in the Doblevia intranet, complementing its current services. Section 3 describes the methodology employed for evaluating the integration of this environment and discusses the main results. Section 4 highlights the implications of integrating a competence-based tool from the perspective of Doblevia. Finally, conclusions and future work can be found in Section 5.

2 Description of the Doblevia business demonstrator

Doblevia cooperative (Doblevia, 2009) is a non-profit organization that supplies educational, social and cultural services in Barcelona, Spain. The organization has a team of 140 people working in management, project coordination, social dynamising activities, education, monitoring, informing and administrative tasks. Doblevia offers social and educational services free-of-charge. Its employees have to master a broad set of competences that enable them to resolve daily issues, establish relationships with clients and participants, prepare reports and statistics, etc. Because of the internal organization of a cooperative, learning activities are very valuable to the personnel. They currently offer training but they are interested in using innovative educational methods and tools to support lifelong learning. Because of this Doblevia decided to collaborate with the TENCompetence project as a business demonstrator. Their goal is to offer training opportunities for competence development to their employees, who typically have changing job requirements. To illustrate the situation, two typical Doblevia staff profiles are: (1) Social education students with good qualifications but without team management skills, and (2) professionals with experience of managing teams but without budget and cost management competences.

In the TENCompetence project Doblevia acted as a user organization which worked with competence development plans associated to their three different main competences profiles: Social coordinator, Monitor and Information Provider. The TENCompetence environment was installed in a computer room in the organization. Once the participants had been introduced to the tools they could decide to use them wherever they preferred (at work, in their personal computer, etc.). Thanks to the web environment of TENCompetence the participants could also carry out training activities in their free-time.

2.1 Objectives of the Doblevia Business Demonstrator

The main goal of Doblevia is to improve their human resource management infrastructure, by achieving the following tasks:

1. Distributing and managing new expert knowledge within the workplace. This knowledge has to be linked with the responsibilities and functions expected from the employees according to the different competence profiles required by the roles in the organization (monitor, social coordinator and information provider).
2. Offering training to personnel to become competent in specific (new, complex and changing) job requirements (e.g., training a monitor who also wants to be a social coordinator, or simply training new monitors so that their proficiency level increases).
3. Increasing their knowledge resource repository, improving their exploitation, management and dissemination. Providing tools to self-organize learning and promoting the voluntary knowledge exchange (e.g., one team design activities or seminars with the objective of developing their competences, Doblevia wants to collect these activities and share it with another team).
4. Motivating their personnel. The employee has to know that they can practice new competences according to their own needs and improve their expertise to be promoted.

2.2 The Business Demonstrator scenario

The plan for integrating the TENCompetence environment in the Doblevia cooperative was:

1. Determine the competences associated with the three main competence profiles (Social coordinator, Monitor and Information Provider).
2. Elaborate a set of competence development plans and embedded activities and resources.
3. Populate the system with the competence development plans.
4. Execute the demonstrator pilot.
5. Evaluate the demonstrator pilot.

Plan item 1: The competences that define the minimum requirements for the three competence profiles of this demonstrator pilot are:

Competence profile “Information provider”:

- Being able to manage the flow of information between customer and service (to inform the potential audience, being able to identify incidences and suggestions)
- Being able to manage the offered services (participants database, statistics, documentation)
- Capacity for dealing with (new) clients and participants
- Coordinating with the rest of the team

Competence profile “Monitor”:

- Being able to perform different types of socio-educative activities (propose, plan, execute and evaluate)
- Being able to document different types of activities and their results
- Group work

- Being able to act in unexpected situations

Competence profile “Social coordinator”:

- Project management (design, planning, development and evaluation)
- Managing objectives (formulation and evaluation)
- Methodology (design and implementation)
- Being able to perform different types of socio-educative activities (propose, plan, execute and evaluate)
- Being able to create content
- Elaboration of reports
- Application of quality standards
- Incidences and suggestions management
- Proposing strategies of community development

Plan item 2: Each one of these competences has to be associated a set of activities that enable the development of such competence. For example a guide for the monitor which explains how to prevent possible labour risks, a test to check their knowledge about quality standards, etc. Different types of activities were created according to the three different competence profiles.

Plan items 3,4 and 5 are described in the following sections.

3 TENCompetence tools used

The TENCompetence environment enables Doblevia’s employees to develop their competences according to the profiles required by the organization. In this context the Personal Development Plan tool (PDP) was used by employees to carry out self-directed learning activities and measure their competence expertise (Martens and Vogten, 2008; Koper and Specht, 2008). The organization also used this tool to monitor the development of the competences. The PDP tool provides an editor for creating competence profiles, competences and the activities related to each competence. The activities can contain a set of documents and links, and the author of an activity has the possibility of adding Units of Learning (UOL). To create UOLs the authors used the ReCourse editor (TENCompetence, 2009a), a tool for creating UOLs compliant with the IMS Learning Design specification (IMS LD) (IMS Global Learning, 2003). This editor also supports the integration of assessment tests compliant with the Question and Test Interoperability specification (QTI) (IMS Global Learning, 2006). The enactment of the UOL is controlled by the IMS LD Runtime environment (TENCompetence, 2009c), a set of tools for publishing, visualizing and interacting with the UOLs. An expert from Doblevia created a set of activities related to the competences profiles presented in the previously section. Two types of activities were included in the competences: simple activities, for instance an activity which contains a manual, and complex activities with a UOL with a QTI test to provide self-assessment activities. The complex activities were created using ReCourse.

The PDP tool was integrated into Doblevia’s human resource infrastructure to support competence development and practice. Doblevia has an Elgg 0.7 web portal (see Figure 1) which they use as a social intranet for sharing information such as calendars, portfolios, blogs, communities, forums, etc. It also includes its own Curriculum Vitae (CV) manager to facilitate the task of those in charge of human resources. To use the PDP tool, an employee has to log-in to the Doblevia intranet and click on “Formació” (Training), (see the button in the number 1 in Figure 1). After clicking the button the

user sees a screen with two icons: the PDP tool (see number 2 in Figure 1) and a user guide of the tool (see number 3 in Figure 1).

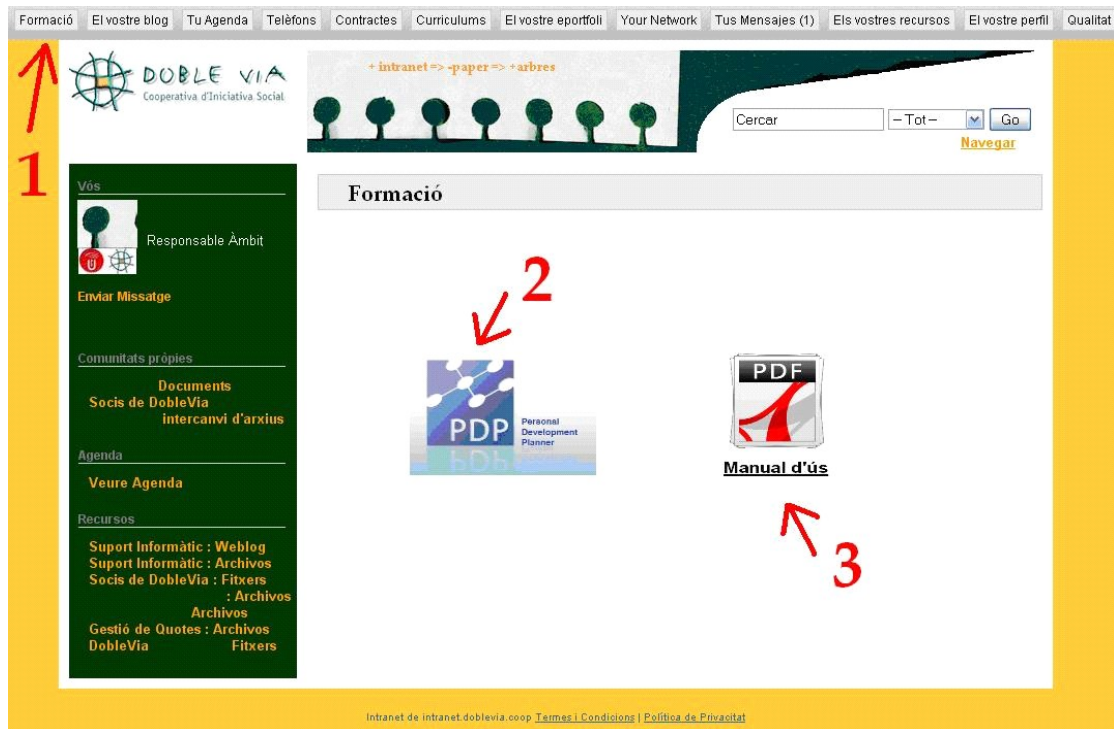


Figure 1. - The Doblevia web portal with the PDP tool.

When the users select the PDP, they enter their username and password, and they are then shown the various competence profiles contained in the tool. The participant selects the competence profile which they want to practice.

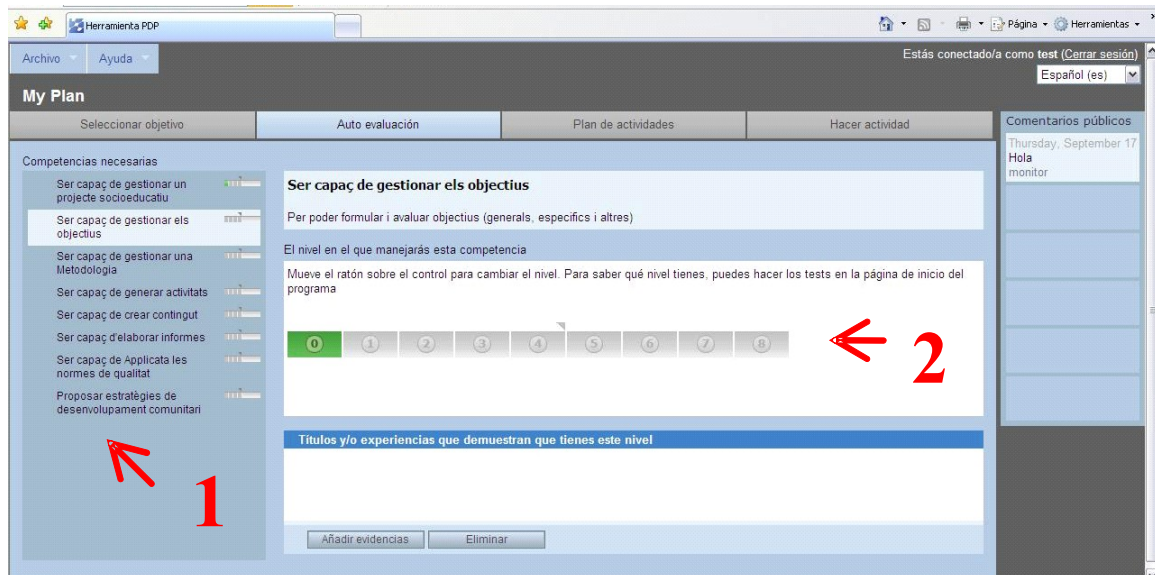


Figure 2. - Self-assessment bar in the PDP tool

Each competence profile has a set of competences, and the user's task is to create

their own personal competence plan, composed of the set of competences that they want to acquire. For each competence in the plan (see Figure 2, number 1) the participant has to indicate their proficiency level using the self-assessment bar (see Figure 2, number 2) of the PDP tool. This bar shows 8 levels of proficiency, following the European Qualification Framework (European Commission, 2008). These have been previously edited by the author of the competence structure to indicate the competence requirements for each for each level.

The users assess their competence for each item, using the self-assessment bar. They then choose a competence they would like to acquire, and move on to carry out some of the activities associated with it.

4 Evaluation

4.1 Methodology

In order to understand if the PDP tool meets Doblevia's expectations, two sessions were performed to collect data from a representative group of employees. Taking into account the competence profiles created for the business demonstrator, two members of the human resource staff selected those participants from Doblevia personnel who had more experience in these areas.

In the first session three participants evaluated the tool. The group was composed of one director and two social coordinators/monitors. Two other employees participated in the second session, one information provider and one social coordinator.

Each session was divided in two parts:

1) In the first part the participants answered a pre-test. The objective of this test was to understand:

- a. the expectations that the participants had regarding a tool to develop their competences;
- b. the type of competence profiles which they develop in their work;
- c. the employees' interests in achieving new competences.

2) In the second part of the evaluation the participants interacted with the PDP tool. Each user had an account on the Doblevia intranet and an account on the PDP tool. The participants created their own personal competence plan, having previously selected a competence profile. They could create their plans, selecting the competences offered, and they were offered the opportunity to carry out a number of different activities: an activity with a user-guide, a QTI test, a simple activity, etc.

In each session the human resource manager of Doblevia of this paper applied an observational method (Zelkowitz and Wallace, 1998) to collect comments, problems and ideas of the participants interacting with the Doblevia web portal and the activities contained in the PDP. Quantitative and qualitative data were collected during the two sessions. Quantitative data were collected with closed-questions in a pre-test (answered before interacting with the PDP) and post-test (answered after interacting with the PDP). Qualitative data were collected using open questions in the pre-test and post-test. Following work with the PDP tool, each participant was interviewed. The evaluation concluded with a discussion with all the participants. The results obtained from the tests, interviews and discussions groups were analysed to identify patterns of events, tendencies, possible problematic points, etc. The

qualitative data collected were more significant than the quantitative data due to the small number of participants. Doblevia was not able to involve more people due to internal limitations (time availability of employees at the time of running the demonstrator).

The average duration of the sessions was 2 hours.

4.2 Results from the experience

The main findings extracted from the pre-test were:

A tool for competence development has to offer functionalities for:

- a) Practising competences to improve their knowledge, abilities or skills. They can use these competences to learn how to solve problems or specific situations in their job.
- b) Sharing of knowledge between people of the same profile.
- c) Offering ways to achieve evidences (certificates, grades and others).

After the interaction with the PDP tool the data collected from the post test reflected that:

- The PDP tool should offer private rights to users. Doblevia employees would not agree to use the tool if, for instance, human resource personnel could use it to check the personal training of an employee, at least not until they had completed a competence profile.
- The tool offers sufficient training functionalities, and enables employees to develop the competences they would need in order to be promoted. They can practice competences to obtain a new job.
- The most valued activities were the self-assessment activities with QTI tests. The tests (an example of this type of activity is showed in Figure 3) allow users to verify automatically if they have achieved the competence, and they appreciated the feedback that each question showed and the final report result of the test.
- The majority of the participants think that the graphical interface of the PDP tool should be improved. They comment that the interface should provide better guidance, with fewer number buttons to improve usability. For example, the PDP could guide the user with numbered stages. Similarly, in the opinion of the users the process of generating their personal plan has too many options.
- Four participants assess positively the learning experience based on TENCompetence tools and one participant indicated that was a negative experience. This latter participant thinks that before using software tools, the organizational strategy /change regarding competence development should be clearer and better organized.
- The participants were working in one competence profile. It should be mentioned that four out of the five participants selected a competence profile related to a better company position (instead of similar profiles). The other participant decided to reinforce the competences of their current profile in order to keep up to date.

Figure 3. - Example of QTI test used in Doblevia

The main findings extracted from the interviews and the final discussions were:

- The participants agree on using the self-directed learning activities that the PDP offers from a distance. But they want some face to face activities associated to these competence profiles
- They would like other colleagues or superiors to be able to recommend activities in addition to those already provided
- Employees of the same team should be able to see the PDP the progress of the other members of the team
- In order to use the system from a distance, they would appreciate having supporting staff or tutors guiding them and giving feedback when they carry out PDP activities.
- The participants noted the flexibility of the approach, basically because it is a web-based, and asynchronous approach to supporting their lifelong learning.

5 Discussion: implications from the perspective of Doblevia

The study of the integration of a competence development tool has enabled to

Doblevia to understand what new changes they have to introduce in their organization and their intranet.

An important element in an organization is the information contained in the CVs of the employee. In the Doblevia web portal there is a section for managing the curricula of their personnel. In this page (see Figure 4) the human resource personnel can access to the employees' picture, and information about their current work position, level of studies and personal data.

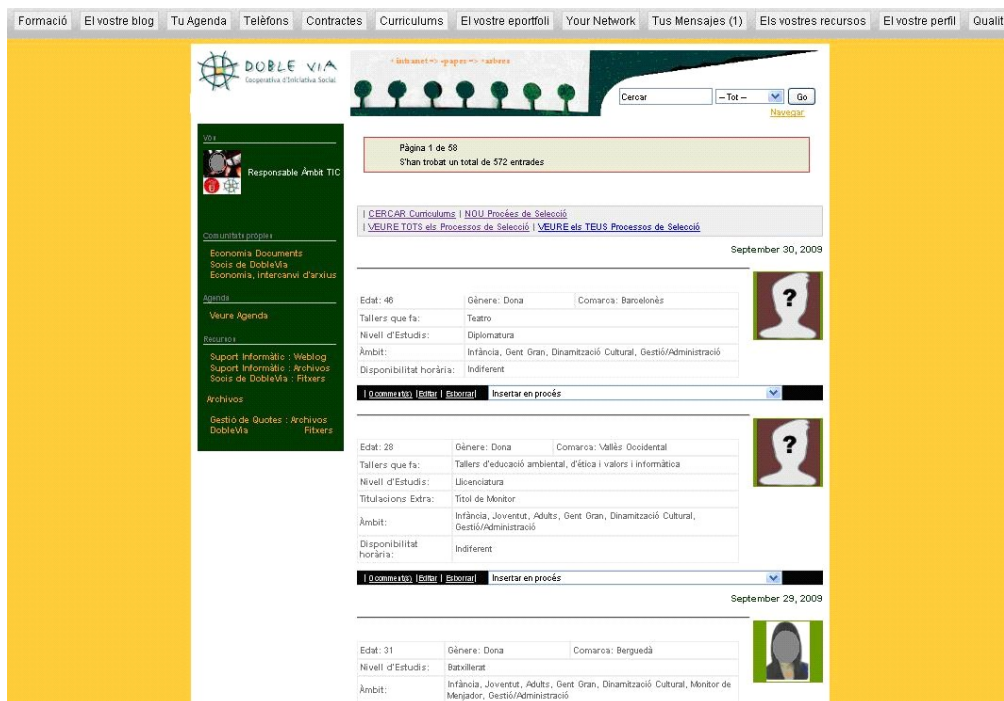


Figure 4 - The Doblevia portal web, curriculum application

For Doblevia, a very important issue would be to connect the data of the PDP with the curriculum application. This would enable the curriculum of the employee to be automatically updated, at the discretion of the employee, adding the competences acquired through use of the PDP tool. This would enable the company to continuously update their employees CVs, and employees would be motivated by this recognition of their achievements.

The application process for job positions is very important in Doblevia. The human resource staff receive a list of candidates and they have identify the best ones. This is a very long process and the staff has to invest a great deal of effort. The TENCompetence environment introduces the possibility of automating all these tasks. It would be an interesting future application if the competences of the required profile could be matched with the competences that the different candidates have and the system could select the best matches automatically.

Other important functionalities for the human resource staff would be:

- The possibility of monitoring activities that do not seem to be of interest to employees. If there are activities which almost never are marked as completed, then these activities can be re-designed.
- Availability of reports on the self-improvement capacity of employees. When the

human resource managers are considering promoting an employee they would like to know if they are more capable than others when acquiring new competences.

While these are important aspects for the organization, the findings of the preliminary evaluation also show that employees want to decide when their personal information can be made public to the employer. For instance they do not want to publish information such as the competences that they have begun to develop (having carried out some activities) but which they have not yet completed. Nor do they want the time that they have spent acquiring a competence to be visible.

6 Conclusions

This paper has described how a competence-development environment can be established in a cooperative. The objective of Doblevia is to improve their human resource management infrastructure at the same time as they evolve into a competence-based organization. As a solution they decided to use the TENCompetence environment. To introduce these changes in the cooperative, a business plan was developed. The first step was to identify the main competence profiles of Doblevia. Once these competence profiles were defined, they used the PDP and the Recourse tool to create activities. The first contact between a group of participants and the PDP tool provided the initial findings, showing that the tool can be used to determine if an employee has the necessary competences to take up a vacancy. The tool was seen as a good solution for training and acquiring new competences, and it was considered that new learning possibilities have a positive effect on motivation of the employees. After the experience with TENCompetence, all participants were keener to keep developing their competences. For example, they now take more seriously the Friday time reserved for competence development activities. The leader of each working group coordinates these activities without an explicit request from the organization. As a first result, one of the participants progressed in developing a higher profile. Her job profile was Monitor and she used the PDP to acquire the competences of the Social coordinator profile. Recently she was upgraded to the role of Director.

The future work of this Business demonstrator includes populating the system and further evaluation experiences with 10% of Doblevia personnel. Once the system is accepted as the competence-development tool of this cooperative, they plan to contact with a company which is specialized in doing the specific competence material that Doblevia needs, and then include the new activities in the PDP.

The cooperative wants to work in a programme to promote the use of the tool, making it possible for their workers to have a room and allocate part of the employees working hours to acquiring competences in the workplace.

Acknowledgement

This work has been partially funded by the European Commission in the TENCompetence project IST-2004-02787. The authors would also like especially thank other members of the GTI group and the Doblevia cooperative including all participants.

References

- Doblevia (2009). *Doble Via: cooperativa d'iniciativa social*. Retrieved October 30, 2009, from <http://www.Doblevia.coop>
- Education Council (2006) *Recommendation of the European Parliament and the Council of 18 December 2006 on key competencies for lifelong learning*. Brussels: Official Journal of the European Union, 30/12, 2006.
- European Commission (2008). *The European Qualifications Framework for Lifelong Learning (EQF)*. Retrieved from http://ec.europa.eu/dgs/education_culture/publ/pdf/eqf/broch_en.pdf
- IMS Global Learning (2003). *IMS learning design specification*. Retrieved from <http://www.imsglobal.org/learningdesign/index.html>
- IMS Global Learning (2006). *IMS question & test interoperability specification v2.0/v2.1*. Retrieved from <http://www.imsglobal.org/question/index.html>
- Koper, R., & Specht, M. (2008). Ten-Competence: Life-Long Competence Development and Learning. In M-A. Cicilia (Ed.), *Competencies in Organizational e-learning: concepts and tools* (pp. 234-252). Hershey: IGI-Global.
- Louys, A., Hernández-Leo, D. Schoonenboom, J., Lemmers, R., & Pérez-Sanagustín, M. (2009). Self-Development of Competences for Social Inclusion Using the TENCompetence Infrastructure. *Educational Technology & Society*, 12(3), pp. 70-81.
- Martens, H., & Vogten, H. (2008). *TENCompetence personal development planner 0.9.3*. Retrieved from <http://dspace.ou.nl/dspace/handle/1820/1545>
- Moghnieh, A., Hernández-Leo, D., Navarrete, T., Santos, P., Blat, J. (2008) *Supporting Distance Learning Activities and Social Interaction: a Case Study*. Proceedings of the 8th International Conference on Advanced Learning Technologies in Santander, Spain, June 1st-5th, 2008, pp. 801-805
- Santos, P., Llobet, W., Hernández-Leo, D., & Blat, J. (2009). *QTI for self-assessment and embedded assessment in competence oriented scenarios: The Agora Case*. Proceedings of the 2009 International Conference on Intelligent Networking and Collaborative Systems (INCoS 2009). pp. 38-45. IEEE Computer Society, Washington DC.
- Stefanov, K., Naskinova, I. and Nikolov, R. (2007), *ICT-enhanced Teacher training for Lifelong Competence Development*, Proceedings of the IFIP IMICT 2007 Conference, Boston, USA, June 2007. Retrieved from <http://dspace.ou.nl/handle/1820/973>.
- TENCompetence (2009a). *ReCourse: LdAuthor*. Retrieved October 30, 2009 from <http://www.tencompetence.org/ldauthor/>
- TENCompetence (2009b). *TENCompetence : Building the European network for lifelong competence development*. Retrieved October 30, 2009 from <http://www.tencompetence.org>.
- TENCompetence (2009c) *TENCompetence learning design runtime update: CCRT 3.3*. Retrieved June 17, 2009, from <http://hdl.handle.net/1820/1778>
- Zelkowitz, M. V., & Wallace, D. R. (1998). Experimental models for validating technology. *IEEE Computer*, 31(5), 23-31.

